EDUCATION TECHNOLOGY PLANNING

A Guide for School Districts

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Developed by the
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Notice

The guidance in *Education Technology Planning: A Guide for School Districts* is not binding on local educational agencies or other entities. Except for the statutes, regulations, and court decisions that are referenced herein, the document is exemplary, and compliance with it is not mandatory. (See *Education Code* Section 33308.5.)

This guide and the pertinent forms are available on the California Department of Education Web site <*www.cde.ca.gov/ls/et/*>.

Prepared for publication
by CSEA members.

Contents

A Message from the State Board of Education and the State Superintendent of Public Instruction

Technology is an essential part of education. The world marketplace of ideas and commerce is changing rapidly in its applications of technology, and the technological skills of our students must rise to the challenge. To compete in the twenty first century, students must be exceedingly proficient in the use of information technology.

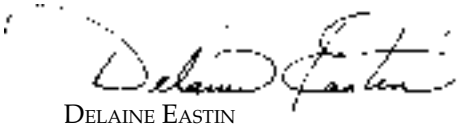
Technology is everywhere. Every sector of our economy—manufacturing, agriculture, communications, services, education, government—is expanding technologically. The important question facing our schools is how well they are able to prepare students for this reality.

Technology can be the key to students' success in school and future endeavors. However, making it so requires access to high-quality resources and training to use those resources effectively in teaching and learning. Planning is fundamental to the appropriate use of technology, as is the successful implementation, monitoring, and evaluation of the plans created.

This guide is designed to help every school district use technology effectively by developing a comprehensive technology plan that addresses curriculum; professional development; infrastructure, hardware, technical support, and software; funding and budgeting; and monitoring and evaluation.

A school district's high-quality comprehensive technology plan must be the product of thoughtful consideration. Ideas and suggestions need to be gathered from all segments of the school community: faculty, staff, parents, guardians, students, and other stakeholders. The planning process needs to be a shared activity involving not only schools and school districts but also the broader community.

We invite and encourage the use of this guide in a comprehensive planning process for technology in every district.



DELAINE EASTIN
State Superintendent of Public Instruction

REED HASTINGS, *President*
California State Board of Education

Preface

All schools in California receiving state categorical funding and all school districts receiving federal Title I funding are required to do comprehensive school improvement planning. (See Appendix A for descriptions of the various legal requirements. Several laws define the content of school improvement plans.) Some low-performing schools receive additional funding to develop improvement plans under the State Immediate Intervention/Underperforming Schools Program. Many programs, including the Digital High School Program, also require school districts to submit school plans.

These planning efforts have one underlying goal: to improve education so that California students are better prepared to become productive citizens. The specific outcomes sought are to help (1) all students in California master the state content standards in English–language arts, mathematics, science, and history–social science; and (2) every school meet its Academic Performance Index (API) target under the Public Schools Accountability Act. Although the required plans will seek to achieve those two outcomes through different means, the various plans need to support one another and work together for the underlying goal to be achieved.

Education Code Section 51871.5(a) requires every school district seeking education technology funding from the California Department of Education to have, as a prerequisite of funding, a local technology plan in place by January 1, 2002. This requirement consolidates various other technology planning requirements:

> It is the intent of the Legislature that education technology planning be accomplished in the most comprehensive manner possible. To that end, the current practice of developing education technology plans for each funding program should be replaced with a comprehensive local planning process that will enable school districts to apply for grants on an ongoing basis and assist in utilizing available education technology programs.

Education technology planning is clearly only a portion of the overall planning that must be done to improve the education of all children in California. The concept of using technology to assist

students in mastering the state content standards and to provide career skills should be included in the comprehensive school district improvement effort. Therefore technology planning should not be an isolated activity but should rather be integrated into the comprehensive school district improvement planning process.

The Commission on Technology in Learning, an advisory body to the State Board of Education, developed *Education Technology Planning: A Guide for School Districts* to assist school districts in their efforts to bring the power of education technology to enhance teaching and learning in California. Whether the technology plan is included in the school district's comprehensive planning document or is written as a stand-alone document, we hope that this guide will both raise awareness of the issues that need attention and serve as a road map that eases the journey into the twenty-first century.

RICHARD A. NAVARRO
Chair, Commission on Technology in Learning

Acknowledgments

Many people helped in the development of *Education Technology Planning: A Guide for School Districts.* The members of the Commission on Technology in Learning were as follows:

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I. Overview of Education Technology Planning

Technology can be a powerful tool in improving teaching and learning as well as in school management. However, technology is only a tool, and one must plan its use if it is to promote improved student achievement within the context of the current system of standards, assessment, and accountability. A plan to integrate technology into the curriculum should have the following five essential components:

1. **Curriculum**
2. **Professional Development**
3. **Infrastructure, Hardware, Technical Support, and Software**
4. **Funding and Budget**
5. **Monitoring and Evaluation**

These five components cover the same areas as the five federal E-Rate Program planning questions that must be addressed to qualify for infrastructure and Internet service provider discounts.

The Curriculum component is at the heart of the technology plan. It outlines how technology will be used to enhance the teaching and learning process. Decisions made in the Curriculum component affect the decisions in the rest of the components. The Professional Development component establishes the methods and schedules for training teachers, administrators, classified staff, parents, and community members, where applicable, to support the Curriculum component of the plan. The Infrastructure, Hardware, Technical Support, and Software component outlines the type of technology and the time frame for when these various technology resources will be obtained in order to accomplish the Curriculum and Professional Development components. Next, the Funding and Budget component establishes the cost estimates and funding sources needed to accomplish the first three components of the plan. Finally, the Monitoring and Evaluation component provides the means by which the school district will determine whether the plan is effective. This last component also includes a decision-making process that provides for revision of the plan where needed.

What is technology?

Technology is the tools and machines that are employed to perform tasks efficiently. For schools, teachers, and students, technology is the tools and machines that save time in student recordkeeping, present course material more dramatically or clearly, and provide more individualized instruction and time on task. It is video streaming from a NASA Web site that shows a star being born or a database that compiles assessments of student performance so that teachers can tailor their instruction more efficiently to the needs of the student. Technology includes, but is not limited to, computers and software, interactive white boards, networked thin clients, television sets, videos, microscopic cameras, computer-based laboratories, digital cameras, personal digital assistant (PDAs), calculators, and whatever else will be invented.

A. Why Plan?

1. The law requires a plan for future funding.

Education Code Section 51871.5, enacted by Assembly Bill 598, (Chapter 830, Statutes of 1999), requires school districts to have a three- to five-year technology plan as a condition of receiving any technology grant administered by the California Department of Education after January 1, 2002.

2. An all-inclusive planning team can create positive change.

Planning together results in a sense of ownership and teamwork that can focus the energies of all constituent groups toward the objective: the effective use of technology to support improved student achievement.

All stakeholders should be included by having the planning team consist of representatives from business, community-based organizations, and institutions of higher education; district administrators in the fields of curriculum and technology; site administrators (elementary, middle, high school, and alternative schools); library media and classroom teachers; classified staff; parents; and students. Section B, "Who Should Develop the Plan," contains more information on the composition of the planning team.

For the purposes of this guide, **teachers** include elementary, middle, high, and alternative school teachers; library media teachers; special education teachers; resources teachers; counselors; and others responsible for the instruction of students.

3. **A comprehensive up-to-date technology plan is an application waiting for a funding program.**

   School districts already develop technology plans to apply for individual programs. This new law requires the plan to be comprehensive and encompass more than one funding source. Thus, the resulting plan could be used to apply for a variety of state, federal, or private and nonprofit grants. This comprehensive plan should allow school districts to respond to public and private and nonprofit funding opportunities more expeditiously and provide for more coordinated program management once the funds are received.

4. **Proper planning saves time and money.**

   Local technology planning helps school districts use technology resources effectively by identifying both current and future needs. Because of the limited funding available to education for technology, one objective of planning is to minimize the purchase of technology that will quickly be outdated. With technology changing so rapidly, planning for current and future uses may pose a challenge. However, the requirement to develop a three- to five-year plan should help districts to think strategically about how limited technology dollars can be used to meet curricular demands over the next several years.

5. **Successful results can be achieved faster with a comprehensive plan.**

   Comprehensive long-range planning provides the details to accomplish desired change. Planning increases awareness of particular needs that, in turn, raise awareness of possible solutions. Schools have reported accomplishing their five-year plan in three years primarily because they knew what they wanted and could take advantage of opportunities as they came along.

B. Who Should Develop the Plan?

1. **Include all the stakeholders in the planning team.**

   Selecting the planning team that will research and write the plan is important. It is important to have not only the people knowledgeable about technology on the planning team but also the people who will implement the plan so that they understand and share ownership of the plan. The persons selected should represent all the constituent groups that will be involved in implementing the plan, including district administrators in curriculum and technology, site administrators, teachers, library media teachers, classified staff, parents, students, community members, and business representatives. Novice and experienced technology users should also be included to ensure that the completed plan meets their needs.

2. **Include representatives from the school district and the school.**

   School district planning typically involves some information gathering (technology inventories) and decision making (delivery of curriculum) at the school site rather than at the district level. A two-tier planning process in which some planning decisions are made at each individual site rather than at the school district level may result in the most workable plan. At the very least, it encourages the inclusion of both district-level staff and site-level staff on the planning team. Remember, successful implementation is more likely if the school sites understand the plan through participation in the planning process.

3. **Obtain the support of the school superintendent and the governing board.**

   The support of the school superintendent and the governing board is so vital to the successful implementation of the plan that both entities should be represented on the planning team. One way to obtain their support is to have the planning team itself appointed by the governing board. The planning team should receive a budget and a schedule for reporting to the board. Depending on the size and expertise of the planning team, the budget may need to include funds for additional support that

may be obtained through a contract. Some of the planning tasks, such as needs assessments and network design, may be completed in this fashion.

4. **Choose the size and structure of the planning team that best meets your district's needs.**

   The size and structure of the team are interrelated and will vary depending on the time and expertise that are available to the district and the number of constituent groups that need to be included. Small teams may find it easiest to work together on every aspect of the plan. If a large team is appointed, it may be most practical to break into working groups with an agreed-upon method of regular communication to share information between the groups. Another model is to appoint a large committee representing all the constituent groups to review and respond to the analysis and recommendations of smaller working groups.

Help from the **community, parents, and students** is vital if a plan is going to succeed. Including the community, parents, and students in every aspect of the planning process will enrich the entire process.

5. **Involve the community, businesses, parents, and students in all aspects of the plan and implementation.**

   The participation of the community, parents, business and nonprofit organizations (especially those concerned with workforce skills), institutions of higher education, and students is vital if a plan is going to succeed. For this reason parent and community involvement is embedded in each of the five components. These partners have a commitment to the betterment of the community, and many have expertise or financial resources that may assist schools in meeting their technology goals.

6. **Establish a common base of knowledge among team members.**

   The planning team may include individuals who do not typically work with one another. It is important for each team member to have a working knowledge of the other team members'

areas of expertise so they all have a common base of information. The jargon of each group will have to be explained so that group members can communicate. For example, technology support staff may need an explanation of content standards while teachers on the team may need an overview of routers, hubs, and switches. Thus, the district's first step in technology planning may be this "cross-pollination" of experts on the staff.

C. How Should the Plan Be Developed?

This guide is intended to present all the issues that need to be addressed to utilize technology as a part of a comprehensive school improvement plan.

The guide describes the five components of the technology plan, suggested action steps and guiding questions, and a toolkit for creating a technology plan that will help students of all ages meet their learning needs, expand their learning opportunities, and enrich their learning experiences. If your school district considers and addresses, where applicable, the issues raised in this guide, your district will have created a plan that can be used not only to obtain E-rate and other sources of technology funding but also to guide the school district's use of technology to improve teaching and learning.

Each school district should develop the technology plan in a manner that best suits its planning resources and decision-making structure. Each school district's planning process will be different due to the current circumstances of the district and prior planning efforts. Even the starting point will vary among districts. The following path is presented to expedite your district's efforts.

1. First Steps

A. Coordinate all components of your plan.

Each of the five components of an education technology plan is so dependent on the next that close communication between the persons working on each component is vital. Additionally, because all components arise from and support the Curriculum

component, consider developing that component first and obtaining stakeholder agreement on it prior to proceeding with the rest of the planning.

B. Review all the existing plans and basic information.

The planning process will be enhanced by gathering all the existing plans and necessary information before the first meeting of the planning team. Consider compiling a library of the following documents to assist the planning team:

- Any existing district and/or site technology plans, E-rate plans, Digital High School plans, Action Plans for Education Technology Staff Development for Grades 4–8 (Assembly Bill 1339)
- Any comprehensive improvement plans developed under the Immediate Interventions/Underperforming Schools Program, the School-Based Coordinated Program, five-year local improvement plans, or Western Association of Schools and Colleges (WASC) reviews
- District budgets, existing technology inventories, technology standards, master purchasing contracts, and any related plans, such as 1882 Staff Development Plans, and 1274 Plans

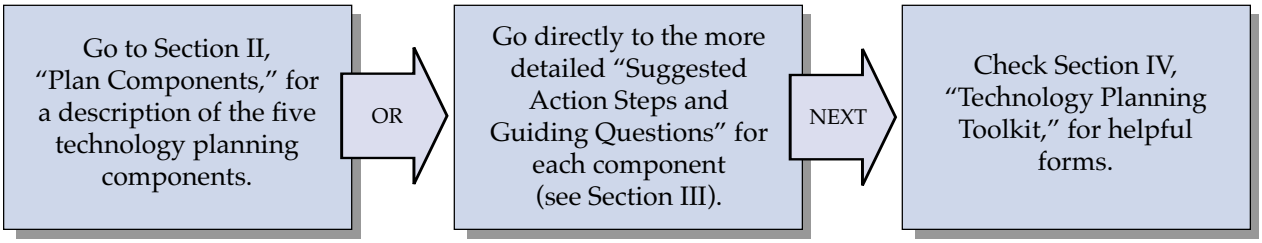
C. Contact the California Technology Assistance Project and read the pertinent parts of this guide.

The California Technology Assistance Project (CTAP) staff is available to assist your district in technology planning. Not only do staff members have experience in planning, but they also know about business and community partnerships in the area, best practices, and cost-saving measures that may assist in planning and implementation. To identify the CTAP staff serving your school district, please visit the California Department of Education Web site <*www.cde.ca.gov/edtech/*>. Information regarding regional contacts may be found by clicking on the California Technology Assistance Project (CTAP) under "Programs."

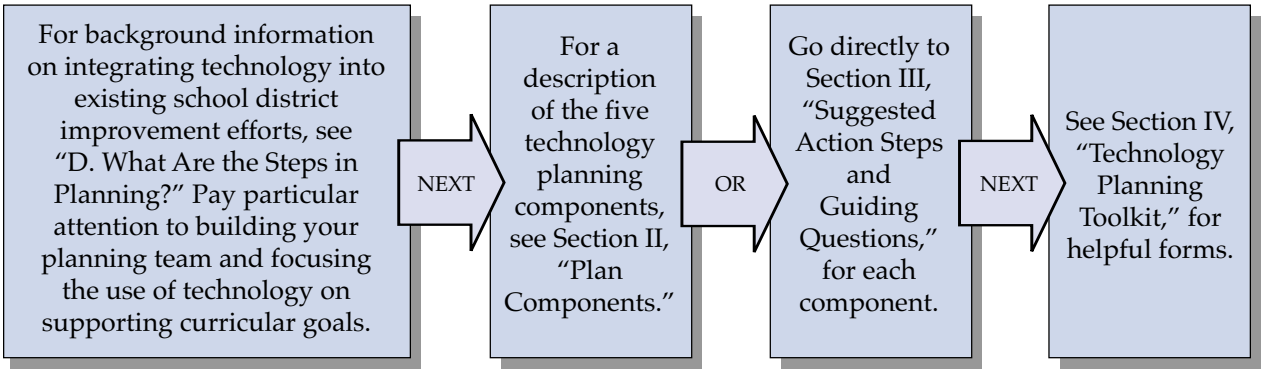
2. Quick Start

Choose the statement that best describes your school district and follow the arrows.

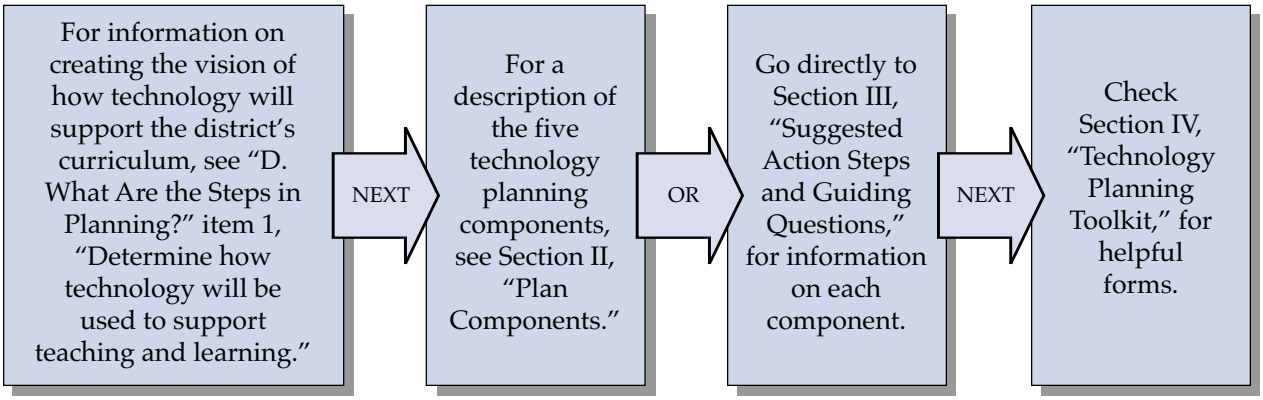
Our district technology plan needs to be updated.



Our district has no technology plan, and the district technology coordinator has been given the responsibility of developing one.



Our district is developing or updating the school district comprehensive improvement plan and wants to include the use of technology to improve student achievement.



Section IV, "Technology Planning Toolkit," includes a checklist of essential components for a technology plan. Review the checklist often to organize your activities, obtain the necessary information and participation, and eventually arrive at a comprehensive technology plan that may be submitted to a governing board.

Technology allows learning to take place all the time. The Lemon Grove Elementary School District in San Diego County has worked with the local community, including the cable company, to deliver no- or low-cost high-speed Internet connectivity between the school district and students' homes. By using cable modem technology and an inexpensive network appliance, students and parents are able to reach their school work and the resources of the Internet at any hour of the day any day of the week. The school district has a powerful tool to use to communicate with parents, encouraging more parent involvement in their students' education as well as providing some adult education by training parents to use the Internet.

D. What Are the Steps in Planning?

An education technology plan should cover five components: Curriculum; Professional Development; Infrastructure, Hardware, Technical Support, and Software; Funding and Budget; and Monitoring and Evaluation. Each component is important for a complete plan. The components are currently required in all plans to qualify for federal E-rate discounts.

A brief discussion of the planning steps follows. More details of each component are described in Section II. In Section III each component is accompanied by a set of action steps and guiding questions to assist the planning team in its deliberations.

1. **Determine how technology will be used to support teaching and learning.**

   All educators have the goal of improving student achievement and preparing students for life and the workplace. An education technology plan outlines how technology can assist in achieving this goal.

   The first step for the planning team is to examine current district efforts in meeting the academic content standards and the vision statements included in the school district and/or individual site comprehensive school improvement plans. The planning team should next examine the many uses of technology and develop a vision of how technology can support the school district's ongoing efforts and long-range goal of helping students meet the academic content standards.

2. **Determine the starting point—how technology is currently used.**

   The steps taken depend not only on the objective but also on the current use of technology and available resources. There are various tools for and methods of assessing the current status of the district's infrastructure, hardware, software, technical support, and staff competencies. Specific methods or resources to assess specific needs are covered under the individual plan components in the next section.

The California Technology Assistance Project (CTAP) has staff and resources available to help the school district and the planning team develop and implement the school district education technology plan. To contact the CTAP staff that provides regional technology services to your district, please visit the California Department of Education Web site <*www.cde.ca.gov/ls/et/*>.

Ideas for enriching the standards-based curriculum through technology are as follows:

- Practice of communication skills, perhaps even in a foreign language, with pen pals through e-mail
- Video conferencing with experts in their field
- Virtual field trips to NASA, the Smithsonian, the Louvre, the Getty, and so forth
- Distance learning for classes that have low enrollments and cannot be offered economically by the school
- Professional development on demand (any time and anywhere)
- Individualized instruction with detailed monitoring of students' progress to assist teachers in developing individualized learning plans for students in specific subjects
- Activities designed to permit teamwork, allowing students to engage in joint projects with their classmates and with students from other states and regions around the world
- Hands-on practice, more time, more content, and more problem-solving
- Communication between school and home (multilingual school/class web pages, e-mail, instant messaging, and/or voice mail)
- Student and parental access at home to learning resources in multiple languages
- Learning resources and assistive technologies with features (e.g., large font size, closed caption video, voice recognition) that accommodate students with special needs
- Internet research opportunities and information literacy skills development
- Library learning resources accessible electronically throughout the school
- Community access to school technology resources to increase adult literacy
- Electronic grade books, digital chalkboards, DVD (digital videodisc) technology, digital photography, video, and CD-ROM read/write drives
- Electronic attendance accounting and other student recordkeeping tasks
- Instructional videos in a variety of languages

3. **Outline the steps to move the district from the present to the future.**

   Section II, "Plan Components," and Section III, "Suggested Action Steps and Guiding Questions," provide detailed help in developing and implementing the components of an education technology plan. Generally, implementation requires well-thought-out timelines that coordinate all the individual steps and benchmarks in each component. For example, a particular lesson plan included in the Curriculum component cannot be presented unless the requisite equipment has been purchased and installed and the necessary training has been conducted.

4. **Reflect and revise.**

   Planning is an ongoing process and should include set times to review progress and revise the plan. Because technology changes rapidly, an annual review process is recommended. Consider scheduling the progress reviews to coincide with the district's budget process to ensure funding decisions are made with the latest information.

> Technology holds immense promise for education. Technology helps people learn, be creative, and become players and communicators in a global village. Technology, tied to the Internet, allows students of all ages to engage in knowledge building on a worldwide stage as never before possible. Many students in high poverty or isolated schools will never have opportunities to learn except through the use of technology.
> —U.S. Department of Education, *Technology Connections for School Improvement: Planners' Handbook.*

II. Plan Components

A. Curriculum

1. Consider curriculum needs in technology planning.

Technology planning should be guided by a collaborative vision of how technology can help students meet the academic content standards and reach the desired learning outcomes identified by a school district and its community in the comprehensive improvement plan. Team members should first review the curriculum goals and current student achievement data and then determine how technology may be effectively used to help students reach curriculum goals. Before teachers can use technology to address content standards, students may need to be provided a means of acquiring and refining technology and information literacy skills. (See Appendix B to learn more about information literacy.)

A copy of the state academic content standards for English–language arts, mathematics, science, and history–social science may be downloaded from the California Department of Education Web site <*www.cde.ca.gov/board*>. Standards for the visual and performing arts adopted by the State Board of Education in January 2001 may be viewed at the Department Web site <*www.cde.ca.gov/shsd/arts*>.

2. Use technology to reduce time spent on administrative tasks and allow more time for instruction.

This component should also address the administrative uses of technology. Using technology to complete recordkeeping tasks more efficiently allows more time to be spent on instruction that improves student achievement. The plan may address other ways in which technology can assist site and district administrators in making decisions based on data.

A fifth-grade teacher has a new student in her class today. Thanks to technology and her district's support for administrative uses of technology, the school receives the student's electronic record on the same day he arrives in the class. The teacher is able to see clearly the new student's progress toward meeting the content standards. She is able to provide instruction tailored to the student's needs from the first day. Before the implementation of the electronic recordkeeping system, she often waited weeks, if not months, for records of new students to arrive.

3. Invest time in learning about the possibilities.

It is critical to educate the planning team on what is possible in a technology-rich learning environment. To accomplish this objective the planning team is encouraged to consider the types of technology that are appropriate and useful for the present and the future. Therefore, it is highly recommended that before writing the Curriculum component, the planning team communicate with its CTAP representative; search the Internet; and visit other schools, nonprofit organizations, and even businesses to obtain ideas about how technology can be used to support standards-based learning and the methods or tools used by teachers, library media teachers, and administrators to create effective learning environments with technology. Visit the California Department of Education Web site *<www.cde.ca.gov/edtech>* for resources on the integration of technology into the curriculum.

Many of the sixth graders at our school are struggling with Algebra and Functions standard 1.0 in the math content standards. We need a new way to get these concepts across to them, but where can we turn?

Visit the CLRN Web site <*www.clrn.org*>. The California Learning Resources Network (CLRN), supported by the California Department of Education, reviews electronic learning resources for alignment with California's content standards and the effective use of technology. This site also provides lesson plans tied to content standards. Just search on a standard, a subject, and/or a grade level to get a list of educator-rated electronic learning resources and lesson plans that can help you present material in new and engaging ways.

4. Include benchmarks and timelines in the plan to describe how and when chosen strategies will be implemented.

For assistance in generating the Curriculum component, see Section III, "Suggested Action Steps and Guiding Questions." The suggested action steps identify the tasks that, if completed, will ensure a thorough and complete plan for integrating technology into the curriculum. The "Timeline of Suggested Action Steps" in Section IV will be helpful to the planning team in assigning responsibilities and setting deadlines to complete the tasks. Guiding questions help identify the issues to be considered under each suggested action step.

Benchmarks and timelines need to be assigned to the proposed strategies. It is especially important to have a clear timeline and benchmarks for the Curriculum component because so many other parts of the plan flow from the decisions made in this part of the plan. A sample management chart and sample implementation timeline are included in Section IV, "Technology Planning Toolkit."

Teachers can use technology to tailor instruction to individual student needs. At Upland High School in Upland, California (a Year 1 Digital High School), one biology teacher has his Advanced Placement students help manage their own learning. Using a strategy called Review Topic Presentations, his students choose a particular science topic to teach to the class. The topic conforms to the College Board exam expectations. These student-directed lessons include a three- to five-minute PowerPoint presentation, live Internet resources, visual aids, and a list of resources for further investigation. The lesson ends with a class discussion and evaluation.

B. Professional Development

1. Professional development is essential to the effective use of technology.

Classroom teachers, library media teachers, administrators, and technical support staff should receive technology training and use it to promote improved student achievement. Businesses consider such training a part of the total cost of ownership; without the training, the equipment is as useless as it would be without electricity. A rule of thumb in the business community is that the amount of resources committed to staff development should be approximately the same as the amount of resources committed to the acquisition of new equipment. School districts should consider adopting this rule as well.

CTAP^2 is an online, self-assessment tool that allows educators to determine their level of technology proficiency: introductory, intermediate, or proficient. The self-assessment is based on rubrics aligned with the California Commission on Teacher Credentialing (CTC) "Factors to Consider," the technology standards for a California K–12 teaching credential. The results of the assessment enable educators to view and select the professional development opportunities that will advance their proficiency level. Visit CTAP^2 at its Web site *<http://ctap2.iassessment.org/>*.

2. Technology training is best integrated into subject matter programs and embedded in the classroom or educational setting.

The plan needs to address how professional development will be delivered and allocate time for this important activity. Appendix C, "The Design Elements for High-Quality Professional Development," provides information on the most effective type of professional development. Because of the reduced number of staff development days, it may be difficult to find time for professional development dedicated solely to education technology. This difficulty may be overcome and professional development enhanced by incorporating technology into existing content-specific professional development.

The best staff development is that which occurs closest to the individual. Teachers learn best by studying, doing, and reflecting; by collaborating with other teachers; by looking closely at student learning and evidence of achievement; and by sharing what they see. Therefore, staff development is best facilitated by being embedded in the workplace. As a part of the plan, time may be provided for collaboration during the workday, and on-site teacher or student "Technology Ambassadors" may be provided to assist teachers and administrators on specific technology projects.

Where can district and site administrators learn about technology planning, integrating technology into the curriculum, data-driven decision making, and other technology topics?

Try TICAL, the Technology Information Center for Administrative Leadership supported by the California Department of Education. Visit the TICAL Web site <*www.portical.org*>, a one-stop, online technology information center with resources and solutions to assist administrators in effective leadership of "digital schools."

3. **Timing is important for effective professional development.**

   On-demand training appears to work especially well for technology in the educational setting. Personnel already in place, such as the library media teacher, technology coordinators, or technology teachers on special assignment, can deliver this technology training when the teacher and site administrator need it.

   The timing of equipment purchases is also important to effective professional development. If the equipment is purchased long before the teachers and administrators have learned to use it, "new" equipment may become obsolete before it is ever used in a classroom. The Professional Development component needs to align with the timeline for equipment acquisition in the Infrastructure, Hardware, Technical Support, and Software component as well as support the goals and the timeline for implementing the technology strategies and methodologies under the Curriculum component.

4. **Benchmarks and timelines in the plan describe how and when chosen strategies will be implemented.**

   For assistance in generating the Professional Development component, see Section III, "Suggested Action Steps and Guiding Questions." The steps identify the tasks to be accomplished for providing the identified professional development. The "Timeline of Suggested Action Steps" in Section IV may be used to assist the planning team in assigning responsibilities and setting deadlines to complete the tasks. Guiding questions help identify the issues to be considered under each suggested action step.

   To implement the plan, the planning team needs to assign benchmarks and timelines to the proposed strategies. The Professional Development component benchmarks and timelines must provide for the necessary professional development in a time frame agreeable with the Curriculum component benchmarks and timeline. At the same time the benchmarks and timelines of the Professional Development component must be consistent with the constraints undoubtedly created by the Infrastructure, Hardware, Technical Support, and Software component timeline.

A sample management chart and a sample implementation timeline are provided in Section IV, "Technology Planning Toolkit."

C. Infrastructure, Hardware, Technical Support, and Software

1. **Generate a list of the technology the school district needs in order to support the Curriculum and Professional Development components.**

   Once the vision, goals, and strategies have been established for using technology to help students meet content standards, the next job is to identify the technology and physical plant modifications needed to accomplish the Curriculum and Professional Development components. Therefore, this component involves assessing the current status of the infrastructure (including the electrical capacity of the building[s]), hardware, software (including online learning resources), and technical support in the school district and planning how those resources can be recycled or supplemented to create the learning environment envisioned in the Curriculum component.

2. **Make the technology available and accessible.**

   The planning team must not only determine how the school district will use technology but also decide where technology will be used. Research on academic gains attributable to technology points to easy access for students and teachers in the classroom as the place in which the greatest impact may be achieved. Technology in the classroom is therefore preferable to technology located only in labs. But will each school also have labs to provide access to technology for students and the community after school as well as for whole-class use? Are labs all the district can afford for the first few years as it begins its acquisition of technology? These and other questions must be answered to make decisions about network capabilities and the amount of hardware purchased for both the short and the long term.

Another location issue is after-school access to technology and the school network. Will teachers, parents, and students be able to gain access to school equipment to complete their work in on-site, after-school programs or in community technology centers? Will they be able to use the school network from home or other nonschool locations?

Do you need assistance in the area of technical support? Are you trying to determine what skills your tech support staff need or how to find training for staff members? Or do you have a technical question and need help?

If so, visit TechSETS (Technical Support for Education Technology in Schools), a statewide education technology service <*www.techsets.org*>. TechSETS is designed to support the escalating need for skilled technology support professionals in schools. This service provides a user-friendly matrix of the technology skills needed by support professionals at different levels, online links to professional development opportunities for tech support staff who need to develop these skills, and an online interactive help desk.

3. Seek expert advice on the best technology to serve the school district for the lowest cost.

Obtaining expert advice can ensure the selection of technology that will best serve the needs of the school district and continue to support the curriculum and academic content standards. For example, if the Curriculum component identifies a need for student access to the Internet for research and word-processing capabilities, all that is technically required are stand-alone computers with modems and telephone lines. However, speed of Internet access, student access to the hardware, storage space (whether each student stores his or her work on a personal disk or on the server), security, and technical support for individual machines are issues that need to be considered. An expert can help the district explore these issues and the long-term costs of the possible solutions so that the district can determine which solution will best serve its needs.

4. Consider security measures for protecting both the equipment and the data.

School districts have many responsibilities when building a technology infrastructure, including devising acceptable-use policies and security procedures. Although most schools report positive experiences with technology, it is still important for districts to have rules specifying the consequences of misuses. Deciding how a school district would respond to technology infractions, such as altered or deleted files, disabled or missing workstations, misconfigured networks, and misuses of the Internet, is important to determine in advance.

There are two types of security issues in a technology infrastructure: physical security and electronic security. Physical security measures include installing and/or upgrading the locking systems throughout the school, installing electronic monitoring devices where technology is stored, and electronically tagging all equipment for easy identification if stolen. Electronic security measures include designing a hierarchical access structure for the network; installing firewalls and filters; installing and continually updating monitoring software to search for and report viruses, thefts, and vandals; and installing backup and recovery tools, such as a tape drive that can record and retrieve all networked files and applications.

5. Consider long-term implications.

Technology planning needs to be comprehensive and include consideration of the long-term implications of the choices made. Consider the following points:

- Hardware purchased should be powerful enough to meet future needs, including the need for data, voice, and video capabilities.
- Hardware purchased should meet district needs and have the lowest cost of ownership over the long term. This may lead to networked thin clients and/or networked computers. (See the Glossary.)

- Hardware purchased should have adequate connectivity and network capacity. Demands for bandwidth increase as more connectivity is added to schools and as technologies, such as video streaming that requires high-capacity connectivity, become more available. Districts should consider these increased demands as they plan for the type of connectivity (wireless, hard-wired, or a combination) provided to individual schools and classrooms.

The Digital California Project <*www.cenic.org/DCP.html*> is a multimillion dollar effort designed to build the necessary network infrastructure needed to prepare California's schools to take advantage of tomorrow's advances in network technology. In essence California is developing an advanced-services network to serve the entire K–20 education and research community.

- The school district should anticipate the obsolescence of technology. The plan should include an equipment replacement schedule that recognizes the useful life of the technology and recycles the old equipment within the district or in the community.
- The plan should result in a student information system that is consistent with local and state data-collection efforts. (Visit the California Student Information System Web site <*www.csis.k12.ca.us*>. The technology plan should promote a system that enables student data to be accessible for analysis by teachers and administrators.
- It is important that school districts plan for adequate technical support for hardware, software, and local and wide area networks. The technology plan should state how teachers obtain technical support, the expected response time, the number of full-time staff needed for technical support, whether students will be involved in providing technical support, and how they will do so. If technical support will be provided in-house, districts are strongly encouraged to establish the maximum number of machines that each technical support person

can maintain and ensure that as the amount of technology expands, the level of technical support is maintained according to the predetermined ratio. For example, if a district with a computer-to-technical support ratio of 50:1 buys 25 new computers, the district will need to identify the budget for another half-time technical support position.

Information needed to make the decisions in this area changes daily. It may be difficult for school districts to keep current with the latest technology. CTAP is available to provide assistance. Some districts find it helpful to do this work in conjunction with an outside consultant. When considering outside consultants, keep in mind that they may favor a particular brand or product; therefore, be sure to ask them to research all possible equipment and infrastructure strategies that would meet the district's needs. It is also recommended that you check consultants' references to ensure that they have the proper expertise and can successfully complete the work you will be hiring them to do.

6. **Include benchmarks and timelines to describe how and when chosen strategies will be implemented.**

For assistance in generating this component, see Section III, "Suggested Action Steps and Guiding Questions." The suggested action steps identify the tasks that need to be performed to meet the identified infrastructure, hardware, technical support, and software needs. The "Timeline of Suggested Action Steps," in Section IV, may be used to assist the planning team in assigning responsibility and deadlines to complete the tasks. Guiding questions help identify the issues to be considered under each suggested action step.

To implement the plan, the planning team needs to assign benchmarks and timelines to the proposed strategies. The benchmarks and timelines must be set to provide for the necessary infrastructure, hardware, technical support, and software in time for use by teachers, students, and administrators. A sample management chart and a sample implementation timeline are included in Section IV, "Technology Planning Toolkit."

Today's electronic learning resources (ELRs) can place a multitude of teaching resources at a teacher's fingertips. ELRs can provide targeted information and/or practice to meet an individual student's need. They can even help the teacher determine where a student is having difficulty and how the difficulty can be mitigated. Some ELRs can even assist the teacher in his or her own development by providing information just in time.

D. Funding and Budget

After an acquisition timeline and a list of needed equipment, infrastructure, and technical support are made, a budget needs to be developed and funding sources identified. Funding is necessary to obtain those items and the training to implement the Curriculum and Professional Development components. The administration and governing board need to understand which expenses are one-time costs and which are ongoing. Recognition of both types of costs is important to garner early commitment for supporting the ongoing costs of maintaining and updating the initial system and the training. Knowledge of which costs are one-time may also be useful in obtaining time and/or resources from private donors who might otherwise be reluctant to make an ongoing financial commitment.

To minimize costs the budget staff should consider hardware and software purchasing agreements in the district and those provided by statewide services, such as the California Statewide Master Agreements for Resources in Technology (C-SMART). The C-Smart Web site is found at *www.c-smart.org*.

Technology, especially the Internet, can bring resources to the classroom to enrich students' learning experiences. For example, at Edison High School (a Year 2 Digital High School) in Fresno, California, the foreign-language teacher uses an Internet browser with audio streaming to bring German radio newscasts, pop music, and talk radio shows to his classroom. The Internet brings his classroom closer to the German culture and real-world language experience.

Just having an education technology plan should increase the resources available. From the outset the district administration and governing board should consider dedicating some ongoing district resources to implement the plan. This act alone will send a powerful message about the importance of the plan and its implementation. Additionally, this plan is structured to meet the planning needs of various state and federal grant programs. The California Department of Education Web site <*www.cde.ca.gov*> should be reviewed regularly to identify the funding for which the school district, or schools within the district, might qualify. Finally, a plan and timeline for the acquisition of specifically identified equipment, hardware, software, and technical support will make it easier to approach the private sector for contributions of discrete pieces of equipment, hardware or software, or the donation of time for technical support.

Finally, although the entire plan needs to be updated regularly, the Funding and Budget component should be kept current so that at any given time the district will know the next piece of equipment that it wants to purchase with the next dollar that comes into the district.

See the suggested action steps and guiding questions for this component in Section III.

Imagine the combined purchasing power of more than 8,000 schools and 1,000 school districts to get better deals on technology purchases. Supported by the California Department of Education, C-SMART is a program that brings cost-effective technology to classrooms. The Web site is at *www.c-smart.org.* C-SMART uses that buying power to negotiate lower purchase prices for hardware, software, and other electronic learning devices. C-SMART works closely with the California Department of General Services and multistate buying powers to provide one-step cost-effective shopping for California school districts.

E. Monitoring and Evaluation

1. Monitor the implementation steps and timelines.

The monitoring of the district's progress in comparison with its original timeline is an important step for managing, updating, and continually improving the plan. Monitoring the implementation of the plan is necessary to evaluate its effect. It is important to know whether all or only some part of the plan has been implemented before determining whether the implementation was effective. Monitoring also allows mid-course corrections if the implementation does not adhere to the schedule. Finally, both the monitoring and the evaluation can help justify the precious expenditures and sacrifices made in the past and help to maintain or even increase funds in the future to support technology expenditures.

2. Evaluate whether the steps taken had the intended effect.

When the district's planning team began the planning process, it focused on the curriculum and the use of technology to help all students master the state content standards and each school meet its Academic Performance Index (API) target. Through the evaluation the district discovers whether its efforts produced results and increased student achievement. To determine whether tech-

nology had a positive impact, possible variables may be considered: student attendance, time-on-task, dropout rate, test scores, student portfolios, or other variables important to the school district and its community. If the intended results did not materialize, the evaluation will assist in determining the next steps that need to be taken to achieve the desired result.

The evaluation may be conducted by an in-house team. An external evaluator, such as someone from an institution of higher education, may also be considered for his or her expertise and perceived impartiality. Remember also that this education technology plan is a part of an overall school improvement plan. Any evaluation of the effect of technology on student achievement should be conducted in collaboration with the overall evaluation of the school improvement effort.

Section III, "Suggested Action Steps and Guiding Questions," which follows, will assist the planning team in generating this component.

III. Suggested Action Steps and Guiding Questions

This section identifies specific issues to be addressed under each plan component. The suggested action steps are in bold and are followed by guiding questions that explore the step in depth. A form to track the persons responsible for implementing each step and setting completion dates is included in Section IV, "Technology Planning Toolkit." The form is titled "Timeline of Suggested Action Steps."

A. Curriculum

Needs and Resource Assessment

Assess the availability of appropriate technology to meet the individual needs of teachers and students both during the school day and outside school hours.

- Is technology currently available to all students? Are all student groups making equal use of the available technology? For example, is technology used by all students as a tool to promote learning or is it accessible only to some groups of students (e.g., to GATE students or students who finish their work early)?
- Is technology currently available to students during after-school hours? Do students have access to technology in their homes, in community libraries, and/or at community centers? Does access differ for different subpopulations of students? If so, what groups of students have limited or no access?
- Do students have access to appropriate technology to support their learning? For example, are assistive technologies available to students with special needs as well as to other students, such as English language learners, who might benefit from the use of those devices and software?

Assess the school district's current use of hardware and software to support teaching and learning.

- How is technology currently being used in classrooms at each grade level and in each content area?
- How is technology being used to provide powerful learning opportunities, especially for special-needs students and students who required additional resources to improve academic performance?
- Has the district established levels of proficiency in technology by grade levels? If so, are these proficiencies woven into the academic curriculum? Are they taught in separate stand-alone technology lessons/classes?
- How are information literacy skills being taught and at what grade levels?
- How is technology being used in the library media center and labs?
- How is technology currently being used by teachers and administrators to promote effective classroom and school management (for example, are attendance data collected electronically or can student records be transferred electronically from one school to another when a student moves)?
- How is technology currently being used to foster improved two-way communication between home and school?
- Does the community, including parents, need adult education in order to use technology for this two-way communication?

Review the school district's curricular goals as presented in various district and site comprehensive planning documents.

- What are the district's curriculum goals and what are the district's plans for assisting students to meet standards and pass the high school exit examination?
- Are targets for improvement in student achievement being met?
- How do local improvement plans, immediate intervention plans, site plans, self-studies, program quality reviews (PQRs), accreditations (e.g., from the Western Association of Schools and Colleges) link technology use to school improvement efforts? How can technology be used to support these plans?

Goals

Develop clear goals and a specific implementation plan for using technology to improve teaching and learning.

- For each grade level and each content area, how can technology be used to help students meet or exceed grade-level standards? What are the specific grade-level short-term (one-year) goals for using technology to help students reach grade-level standards? What are the long-term (three to five years) goals?
- How will technology be used to create more powerful learning experiences to meet the needs of all students?
- How will technology be used as a diagnostic tool?
- How will distance learning, including online Advanced Placement courses, expand content offerings and/or access to K–12 classes?
- How will technology be used to help students pass the *California High School Exit Examination?*
- What is the role of the library media center in using technology to support the district's curricular goals?
- How will elementary, middle, and high schools work together to ensure that technology supports student needs at all levels?
- When will each of the proposed strategies or methodologies utilizing technology be employed?

Develop clear goals and a specific implementation plan describing how and when students will acquire technological and information literacy skills needed to succeed in the classroom and the workplace.

- How will the plan address technology proficiencies and information literacy skills?
- How will elementary, middle, and high schools work together to ensure that students acquire and retain the identified technology and information literacy skills? How will the library staff assist in ensuring students become effective users of information?
- Will graduation or matriculation requirements include a technology component? If so, how will the plan address helping all students meet these requirements?

Develop clear goals and a specific implementation plan for programs and methods of utilizing technology that ensure appropriate access by all students.

- How can technology be used to extend the school day for students and to make learning resources available during after-school hours?
- What steps can the school district take to ensure equity of access for all students regardless of their academic standing, socioeconomic level, proficiency in English, or disabilities?
- How can technology be used to help support students with special needs?
- Is the school district's acceptable-use policy for access to the Internet up-to-date? How is access to only appropriate Web sites accomplished?

Develop clear goals and a specific implementation plan to utilize technology to make student recordkeeping and assessment more efficient and supportive of teachers' efforts to meet each student's academic needs.

- How will technology assist with student assessment?
- How will technology be used to track a student's progress toward meeting the content standards and passing the *High School Exit Examination*?
- How can teachers and principals reduce the amount of time spent on administrative tasks, such as attendance and grading, by using technology?
- How will data be made more easily available to teachers and principals so that they can make informed decisions?

Develop clear goals and a specific implementation plan to utilize technology so that teachers and administrators can be more accessible to parents.

- Have parents been consulted to determine the ways in which technology may be used to foster better communication between home and school?

- Have parents been made aware of the benefits of education technology and how they might assist their student and/or their school in the use of technology?

Compile benchmarks and a timeline for implementing the strategies and activities. (See a sample management chart and sample implementation timeline in Section IV, "Technology Planning Toolkit.")

Monitoring and Evaluation

Develop a process to monitor whether the strategies and methodologies utilizing technology are being implemented according to the benchmarks and timeline.

- How often will progress be monitored and who will monitor the timeline and progress toward the benchmarks and the timeline for:
  - Using technology to improve teaching and learning?
  - Teaching technology and information literacy skills?
  - Ensuring equitable access to technology for all students?
  - Using technology to improve student recordkeeping?
  - Using technology to make teachers and administrators more accessible to parents?
- How often will the status of implementation of the Curriculum component be reported to the district superintendent? To the local governing board?
- What steps will be taken if parts of the plan are not being implemented on schedule?

Determine the indicators of success that will be used to evaluate whether implementation of the plan has made a positive impact on student achievement.

- How will the school district know whether implementation of this plan has made a positive impact on teaching and learning?
- How will the district know whether implementation of this plan has made a positive impact on classroom, library, and school and school district management?

- What indicators of success will be used (e.g., passing score on the *High School Exit Examination*, number of students successfully meeting grade-level standards and advancing to the next grade, reduced dropout rate, increased attendance)?

B. Professional Development

Needs and Resource Assessment

Survey teachers' and administrators' current technology skills and needs for professional development.

- Are teachers and administrators personally proficient in the use of technology? (See Appendix D, "Levels of Proficiency in Technology Skills.")
- Do teachers and administrators know how to utilize technology in a standards-based curriculum? (See Appendix E, "Matrix of Professional Teachers' Proficiency in Computer-Based Technology.")
- Do teachers have the classroom management strategies to work with the amount of technology actually available in the classrooms?
- What do teachers and administrators consider as their needs for professional development?

Research professional development opportunities.

- What professional development does the regional CTAP provide? Is CTAP available to customize training to meet the school district's needs?
- What kinds of training (e.g., local and distance learning) do institutions of higher education provide?
- What professional development is available through statewide education technology services, such as Technology Information Center for Administrative Leadership (TICAL)?
- What professional development opportunities are available online or through software?

- Do these existing sources of professional development focus on using technology to improve teaching and learning in a standards-based curriculum?
- Do these existing sources of professional development incorporate "The Design Elements for High-Quality Professional Development" (Appendix C)?

Goals

Develop clear goals and a specific implementation plan for providing professional development opportunities based on the needs assessment and the Curriculum component benchmarks and timeline.

- What professional development will be provided to meet the needs of the teachers and administrators as identified through the needs assessment and established curriculum priorities? Does it focus on using technology to improve teaching and learning in a standards-based curriculum? Does it address any needed technology skills development?
- How will professional development be implemented and how will professional growth be supported as teachers and administrators apply what they are learning?
  - Who is responsible? Do the curriculum coordinator, professional development coordinator, technology coordinator, and library media coordinator for the district all share responsibility for integrating school improvement and technology initiatives?
  - Is professional development embedded in the workplace to promote practicing new skills and collaboratively discussing experiences?
  - Is professional development accessible to those who need to participate?
  - Do those participating in professional development have access to the technology tools they need to apply new skills immediately following the training? How will professional development plans be coordinated with purchasing plans to facilitate access?

  - Is timely support available as teachers and administrators try to implement new skills?
  - Does the professional development program help teachers use technology to increase their own subject matter knowledge and/or advance their own professional learning?
  - How will the professional development program incorporate "The Design Elements for High-Quality Professional Development" (Appendix C)?
- How will teachers and administrators be involved in planning their own professional development in accord with the established priorities?
- What is the time frame for providing professional development? What is the first type of professional development that is needed? What is the second type and so on?

Compile benchmarks and a timeline for implementing the strategies and activities. (A sample management chart and sample implementation timeline are provided in Section IV, "Technology Planning Toolkit.")

Monitoring and Evaluation

Develop a process to monitor whether the strategies and methodologies utilizing technology are being implemented according to the benchmarks and timeline.

- How often will progress be monitored and who will monitor the timeline and progress toward the benchmarks for professional development?
- Were all aspects of the professional development program implemented? If not, why not?
- Did teachers and administrators feel supported after the initial training when questions or new situations arose?
- Did teachers and administrators use what was taught? Has the professional development program resulted in changes in instruction over time?

- If change has occurred, did it have a positive effect on student learning?
- How often will the status of implementation of the Professional Development component be reported to the district superintendent? To the local governing board?
- What steps will be taken if parts of the plan are not being implemented on target?

C. Infrastructure, Hardware, Technical Support, and Software

Needs and Resource Assessment

Determine the technology hardware, electronic learning resources, networking and telecommunication infrastructure, physical plant modifications, and technical support needed by teachers, students, and administrators to support the activities in the Curriculum and Professional Development components.

Hardware

- What technology is needed to implement the Curriculum and Professional Development components for students and staff? Where will the technology be placed to support most effectively the Curriculum and Professional Development components?
- Does the school district have minimum specifications for the technology to be purchased? Do these specifications need to be developed or amended?
- Is the total cost of ownership of the technology being considered? If so, how is this addressed?
- Is specialized technology needed to meet student needs?
- Can assistive technologies be beneficially used by student populations not traditionally served by this equipment?
- How will the plan ensure that technology is accessible to all students? How does the plan promote accessibility to technology during after-school hours?

- How will the plan ensure that technology is accessible to teachers and administrators as they apply what they have learned through the professional development provided?

Electronic Learning Resources

- Will the school district adopt software standards and make particular productivity tools and/or courses on software available to all teachers and students? Will these standards address features that promote accessibility, such as the ability to enlarge the font size or to have the text read aloud?
- How will electronic learning resources be selected for each grade level to support the academic content standards? How will the services of the California Learning Resource Network (CLRN) be utilized in this effort?
- Will the electronic learning resources that reside in one location, such as the school library, be made available throughout the school and/or community through a wide area network (WAN) and/or the Internet?
- Which of the needed resources are available online?
- What resources are needed for management, student recordkeeping, and planning?
- Will the management and student recordkeeping software be compatible with other local and state (CSIS) data collection systems?

Networking and Telecommunications Infrastructure

- Will the plan include schoolwide electronic networks? What is the best configuration for these networks? What will it take to implement these designs?
- What is the target bandwidth for networks at school sites and how will this be achieved?
- What is the target bandwidth for networks to classrooms and library/media centers?
- Are these bandwidths sufficient to utilize video streaming and make optimal use of the Digital California Project and other emerging technologies?

- Will there be a district WAN? What is the best configuration for the network? What will it take to implement?
- Could a community WAN be created that would connect community centers, libraries, museums, schools, institutions of higher education, and private homes?
- What security is necessary to protect confidential data and maintain the integrity of the system? Have firewalls and encryption been considered?
- Will filtering software be used to prevent staff or student access to inappropriate Internet sites?
- Will students and teachers be able to access their work from any location in the school or from home?
- Will parents and community members be able to access school information from home computers?
- Will parents be able to access information about their children through home computers?

Physical Plant

- Is there sufficient electrical capacity to the necessary parts of the schools and outlets in the classrooms and libraries to support the hardware and infrastructure planned for each site? Has the electrical system been evaluated and any necessary upgrades planned?
- Are the storage rooms and classrooms in which infrastructure, hardware, and electronic resources reside secure or do they require modification to become secure?
- Is the planned layout of hardware and ancillary wiring configured in a way that is safe for students to move about without creating a fire hazard?
- Have building inspectors and the fire marshal been consulted to ensure code compliance and safety?
- Is there safe and secure access to labs that will be used during nonschool hours by students and/or the community? Are school buildings, property, and users safe and protected?
- Is there a process in place to screen contractors, such as checking their references, prior to hiring them to do the work?

Technical Support

- How will technical support needs be addressed to ensure that the hardware, local area networks (LANs), WANs, and peripherals such as printers function adequately and that problems are addressed within an acceptable response time?
- What is the target ratio of hardware to technical support personnel?
- How will questions regarding software be handled to provide support to teachers within an acceptable response time?
- If the plan includes involving students in technical support, how will the plan be implemented to encourage all students to participate and be trained?

Determine the existing hardware, Internet access, electronic learning resources, infrastructure, and technical support already in place in the school district that could be used to support the Curriculum and Professional Development components.

Hardware (For each site)

- Does the district have an inventory system or does one need to be developed to track the type and age of hardware? (See Section IV, "Technology Planning Toolkit," for a sample school site technology inventory form or visit the California Department of Education Web site <*www.cde.ca.gov/edtech*> to complete a technology survey online.)
- Can existing equipment be modified to meet certain needs identified in the plan?
- Can equipment that does not meet school site needs in the plan be modified to support home access to the school network and/or Internet?

Electronic Learning Resources (For each site)

- For each grade level, what electronic learning resources are currently being used for instruction and/or student assessment?

- How frequently is each type of technology resource used?
- Is each resource used in the classroom, in the library, or in a computer lab?
- Do the licenses for the software currently owned by the school district allow the use of the software by multiple users or through a network?

Networking and Telecommunications Infrastructure (For each site)

- What is the capacity and configuration of networks in the district? Are any areas not connected to the network?
- Is the current Internet service provider able to meet needs?
- How many telephone lines are there to the site and what is the capability of the telephone system (e.g., is there voice mail)?
- Do all staff members have e-mail accounts? Do students have access to e-mail?

Technical Support (For each site)

- Who provides technical support and what is the response time?
- Is this level of technical support meeting the needs of teachers and administrators?

Seek advice and support from experts.

- Has the CTAP regional representative been contacted for guidance?
- Have other districts been contacted regarding their hardware, software, or networking standards that could be utilized to develop the plan?
- Are there industry members and/or nonprofit organizations nearby that may be able to contribute the latest technical information and/or equipment?
- How can the expertise of parents and community groups be solicited and included in the development of this component?

Goals

Develop benchmarks and a timeline for obtaining the needed hardware, infrastructure, learning resources, and technical support required to support the other components. (A sample management chart and implementation timeline are provided in Section IV, "Technology Planning Toolkit.")

- What is the order and timing of purchases over the three- to five-year period necessary to support the timelines in the Curriculum and Professional Development components? Can this acquisition timeline be accomplished with the estimated available resources in the Funding and Budget component? Are there ways that the Curriculum and Professional Development components can be phased in to match the resources available as identified in the Funding and Budget component?
- Do district policies regarding technology purchases need to be updated? For example, are procedures going to change to promote using only electronic learning resources with features that allow universal access? If so, what is the timeline for these changes?
- Will the new technology be delivered (i.e., installed and tested) near the time of teacher professional development?
- Can the summer months be used to install equipment or software as well as provide training?
- Does the timeline take into consideration other overlapping efforts, such as building modernization or instructional material purchases, that could affect the cost and timing of the efforts?

Monitoring and Evaluation

Develop a process to monitor whether the benchmarks are being reached within the specified time frame.

- How often will progress be monitored and who will monitor the timeline and progress toward the benchmarks in the component?
- How often will the inventory of technology resources be updated and who will be responsible for updating it?

- How often will the status of implementation of the Infrastructure, Hardware, Technical Support, and Software component be reported to the district superintendent? To the local governing board?
- What steps will be taken if parts of this component are not being implemented on schedule?

D. Funding and Budget

Needs and Resource Assessment

Identify all costs associated with implementing each component. (Sample budget forms are provided in Section IV, "Technology Planning Toolkit.")

Identify the current budget for implementing each component.

- What provisions in the current budget are made for technology expenditures, and what options exist to fund technology over time?
- Has the school district established separate SACS (standardized account code structure) codes for any items in the budget to improve the ability to monitor gradual implementation of the plan?

Identify established and potential funding sources, present and future. (A sample sustainability chart is provided in Section IV, "Technology Planning Toolkit.")

- Has the amount of district funding available for technology been identified?
- Have alternative sources of funding, such as those available through partnerships, been identified?
- Are there federal, state, or local programs that could provide funding for technology?
- Would allocating resources for grant writing proposals be a viable option?

Consider options for reducing costs.

- Have any hardware and software purchasing agreements within the school district been considered?
- Have C-SMART discounts/purchasing options been considered?
- Are there nearby industry experts or nonprofit organizations that may be willing to be a partner in the support of the district's technology efforts?
- Have the potential purchases been advertised to parents and the community? (An individual or an organization may be willing to donate services, money, or product.)
- Could leasing equipment minimize costs and/or help resolve support issues?
- Can the professional development be provided at a lower cost and more effectively by integrating the technology training into existing professional development on content or pedagogy?
- Is the on-site expertise of library media teachers used effectively in the professional development plan?

Goals

Develop and implement annual budgets for the term of the plan (three to five years).

- Does the budget include allocations to acquire the hardware, electronic learning resources, infrastructure, professional development, and technical support necessary to implement the plan?
- Within each year's budget, have one-time costs been identified as well as ongoing costs?
- Can some of the professional development be provided by CTAP at a reduced cost?
- What other sources of low-cost professional development does CTAP recommend?

Provide for ongoing technical support.

- Could extended warranties from the seller or contracted technical support provide some of the needed maintenance or is it more cost-effective for the school district to employ staff for the required level of technical support?
- Is there backup equipment available should key components break down? If not, does the budget include funding to acquire this equipment?
- Have other options for technical support been considered, such as student-based or parent-led programs that incorporate advanced technology training for program participants?

Plan for the obsolescence of equipment.

- What replacement cycle has been built into the plan? Will adequate funding be set aside for replacements?
- Have feeder schools in the district or low-income families been considered as recipients of older equipment?

Monitoring and Evaluation

Establish a feedback loop to monitor and improve progress.

- Has technology budgeting been integrated into the district general budget process in a manner consistent with the Funding and Budget component?
- Has a process for monitoring modification of the physical plant, acquisition of equipment, and updating of the budget and budget process been agreed on? Has the person who will be responsible for administering this monitoring process been identified?
- Have regular meetings been scheduled with the superintendent and/or district governing board to (1) update them on progress in obtaining funds to support implementation of the plan; (2) explain difficulties; and (3) offer revisions to the plan to resolve the problems?
- What steps will be taken if parts of the Funding and Budget component are not being implemented on schedule?

E. Monitoring and Evaluation

Needs and Resource Assessment

Review the implementation monitoring process included under each component of the plan.

- How will the timelines and benchmarks included in each component of the plan be used to create an overall system for measuring the successful implementation of the plan?
- How will the level of technology used be determined over time? What data will be collected? What are the data collection intervals?
- How will data be collected and analyzed to ensure that equity and access issues for students, as well as for teachers and administrators, are monitored on an ongoing basis?

Determine how to evaluate the impact of technology on student learning.

- What criteria will be used to measure success (e.g., test scores, student portfolios, percentage of students attaining grade-level content standards, attendance, dropout rate, matriculation to college, or full-time employment)? Are they the same criteria established for measuring success in the school district's comprehensive local improvement plan?
- How will the evaluation treat special populations to determine not only the overall effect of the use of technology but also its effect on targeted populations, such as lower socioeconomic students, high-achieving students, special education students, and so forth?
- How will the evaluation take into account different levels of access and type of use?
- Have teachers and site administrators been consulted in determining the criteria that will be used to measure success?
- Has the CTAP regional representative been contacted for guidance and assistance?
- Have institutions of higher education with expertise in education technology been contacted for guidance and assistance?

Research and consider monitoring and evaluation tools provided at little or no cost to the school district.

- Has the CTAP regional representative been contacted for guidance and assistance?
- Have institutions of higher education with expertise in education technology been contacted for guidance and assistance?
- Are there nearby members of industry that may be willing to partner in the evaluation process?
- What resources from government, nonprofit agencies, and/or industry would be useful?
- Have other district technology and library media coordinators been contacted regarding recommendations for evaluation design and/or instruments?

Design a schedule for evaluating the effect of plan implementation while realizing that infusing technology into daily school operations is an evolving process. (A sample management chart and implementation timeline are provided in Section IV, "Technology Planning Toolkit.")

- How often will plan implementation be evaluated and who will evaluate the effect of the plan on teaching and learning?
- How will data be collected and analyzed to ensure that equity and access issues for students, as well as teachers and administrators, are evaluated on an ongoing basis?
- Have teachers and site administrators been consulted in designing the data collection method?
- Is there an open line of communication for teachers, parents, and other stakeholders to provide their suggestions and opinions in the evaluation process?
- What will be the frequency of reporting evaluation results? Will reporting be done at least yearly?

Determine how and when the results of the monitoring process and evaluation will be used.

- How often will the status of plan implementation be reported to the district superintendent? To the local governing board? To other stakeholders?
- If necessary, what process will be used to make mid-course corrections as a result of the monitoring effort or the evaluation?
- How will strategies that have had a positive effect on teaching and learning be communicated to others so that they can be replicated?
- How will technology success stories be documented and publicized?

IV. Technology Planning Toolkit

Timeline of Suggested Action Steps

Curriculum

Action Step	Person Responsible	Completion Date
Assess the availability of appropriate technology to meet the individual needs of teachers and students both during the school day and outside school hours.		
Assess the school district's current use of hardware and software to support teaching and learning.		
Review the school district's curricular goals as presented in various district and site comprehensive planning documents.		
Develop clear goals and a specific implementation plan for using technology to improve teaching and learning.		
Develop clear goals and a specific implementation plan describing how and when students will acquire technological and information literacy skills needed to succeed in the classroom and the workplace.		
Develop clear goals and a specific implementation plan for programs and methods of utilizing technology that ensure appropriate access by all students.		
Develop clear goals and a specific implementation plan to utilize technology to make student recordkeeping and assessment more efficient and supportive of teachers' efforts to meet each student's academic needs.		
Develop clear goals and a specific implementation plan to utilize technology so that teachers and administrators can be more accessible to parents.		
Compile benchmarks and a timeline for implementing the strategies and activities.		
Develop a process to monitor whether the strategies and methodologies utilizing technology are being implemented according to the benchmarks and timeline.		
Determine the indicators of success that will be used to evaluate whether implementation of the plan has made a positive impact on student achievement.		

Professional Development

Action Step	Person Responsible	Completion Date
Survey teachers' and administrators' current technology skills and needs for professional development.		
Research professional development opportunities.		
Develop clear goals and a specific implementation plan for providing professional development opportunities based on the needs assessment and the Curriculum component benchmarks and timeline.		
Compile benchmarks and a timeline for implementing the strategies and activities.		
Develop a process to monitor whether the strategies and methodologies utilizing technology are being implemented according to the benchmarks and timeline.		

Infrastructure, Hardware, Technical Support, and Software

Action Step	Person Responsible	Completion Date
Determine the technology hardware, electronic learning resources, networking and telecommunication infrastructure, physical plant modifications, and technical support needed by teachers, students, and administrators to support the activities in the Curriculum and Professional Development components.		
Determine the existing hardware, Internet access, electronic learning resources, infrastructure, and technical support already in place in the school district that could be used to support the Curriculum and Professional Development components.		
Seek advice and support from experts.		
Develop benchmarks and a timeline for obtaining the needed hardware, infrastructure, learning resources, and technical support required to support the other components.		
Develop a process to monitor whether the benchmarks are being reached within the specified time frame.		

Funding and Budget

Action Step	Person Responsible	Completion Date
Identify all costs associated with implementing each component.		
Identify the current budget for implementing each component.		
Identify established and potential funding sources, present and future.		
Consider options for reducing costs.		
Develop and implement annual budgets for the term of the plan (three to five years).		
Provide for ongoing technical support.		
Plan for the obsolescence of equipment.		
Establish a feedback loop to monitor and improve progress.		

Monitoring and Evaluation

Action Step	Person Responsible	Completion Date
Review the implementation monitoring process included under each component of the plan.		
Determine how to evaluate the impact of technology on student learning.		
Research and consider monitoring and evaluation tools provided at little or no cost to the school district.		
Design a schedule for evaluating the effect of plan implementation while realizing that infusing technology into daily school operations is an evolving process.		
Determine how and when the results of the monitoring process and evaluation will be used.		

Sample School Site Technology Inventory

An inventory should be completed for each school in the district. An alternative inventory is available online. The results of the California school technology survey are similar to those collected on this inventory. School districts annually are requested to complete the online survey for each of their schools. Districts may find it more efficient to use the online survey for determining some or all their technology needs.

I. Computers

Include the number and type of school-owned computers for each location in your school. Please include laptop (L) and desktop (D) computers, as well as thin-client (TC) units, in your count. Use numbers, *not* words such as *all* or *none*.

A multimedia computer is one that has, or is connected directly or by network to, a CD-ROM drive and can take advantage of audio and video files stored there.

	In Classrooms			In Computer Labs			In Shared or Common Space (e.g., library)			In Administrative Offices		
With Internet Connections	**L**	**D**	**TC**	**L**	**D**	**TC**	**L**	**D**	**TC**	**L**	**D**	**TC**
Multimedia Computers												
All Other Computers												
Without Internet Connections	**L**	**D**	**TC**	**L**	**D**	**TC**	**L**	**D**	**TC**	**L**	**D**	**TC**
Multimedia Computers With Internet Capabilities												
Multimedia Computers Without Internet Capabilities												
All Other Computers												

Of the existing inventory, indicate the number of computers to be used as is, to be upgraded, or to be retired when new/upgraded equipment is available.

Equipment to Be Upgraded or Acquired According to the Plan

	In Classrooms	In Computer Labs	In Shared or Common Space (e.g., library)	In Administrative Offices
Desktop Computers				
Use as is				
Upgrade				
To be retired when new or upgraded equipment is available				
Number needed				
Laptops				
Use as is				
Upgrade				
To be retired when new or upgraded equipment is available				
Number needed				
Thin-Client Units				
Use as is				
Upgrade				
To be retired when new or upgraded equipment is available				
Number needed				

II. Peripherals

Peripherals	Number on Hand	Number Needed
Digital cameras		
Scanners/digitizers		
Assistive/adaptive device		
Printer		
VCR unit		
Video camera		
TV monitor		
Graphing calculator		
Computer screen projector (e.g., LCD)		
Video conferencing unit		
Interactive white board		
Personal digital assistant		

III. Site Networks and Connectivity

A. Is the school site connected to the Internet by a permanent (non-dial-up) connection?

☐ Yes ☐ No

B. If so, how is your school connected to the Internet?

☐ ISDN ☐ Cable-modem ☐ xDSL
☐ Frame relay ☐ Fractional T-1 ☐ Full T-1
☐ ATM/DS3 ☐ ATM/SONET OC3 ☐ Microwave
☐ Wireless (not microwave)
☐ Other, please specify: _____

C. Do you know the speed of your connection? ☐ Yes ☐ No

If yes, please indicate the speed below. If you do not know, please leave this blank.

☐ less than 56K bps ☐ 1.5M bps ☐ 30M bps
☐ 128 K bps ☐ 5M bps ☐ 40M bps
☐ 256K bps ☐ 10M bps ☐ greater than 40M bps
☐ 384K bps ☐ 15M bps
☐ 512K bps ☐ 20M bps

D. What is the total number of classrooms that are connected to the Internet by a permanent (non-dial-up) connection? _____

	Number of Classrooms	Average Number of Drops/Classroom	Number of Administrative Offices
Currently Connected to the Internet			
Need to Be Connected to the Internet			
Currently Connected to a LAN			
Need to Be Connected to a LAN			

Who is the school's Internet service provider?

- ☐ District office
- ☐ County Office of Education
- ☐ California State University / University of California
- ☐ Commercial provider (e.g., Earthlink, MCI, Sprint, etc.)

IU. Site Telephone Systems

Number of lines: _____

U. Site Libraries

Hours that the site library is open: _____

Sample Partnerships Chart

Complete the chart provided below to describe the role of partners in the design and implementation of the technology plan. If one or more type of partner will not be involved in the development of the plan or the ongoing support of the project, state "No involvement from this partner" in the appropriate box and then describe the steps taken to encourage their participation and why the group(s) did not participate.

Type of Partner	Name of Partner and Contact Information	Role in Development of the Technology Plan	Role in Supporting the Project
Parents			
Businesses			
Postsecondary institutions			
Government agencies, including county offices of education and CTAP			
Community groups			

Sample Management Chart

Define the leadership structure for implementing the technology plan.

Individual(s) Responsible (Person(s) or Job Title(s))	Responsibilities (Samples)	Time Estimate (Hours per month or no. of full-time staff)
	Provide overall management and coordination.	
	Manage and coordinate staff development.	
	Manage and coordinate hardware acquisition and installation.	
	Coordinate ongoing partner involvement.	
	Collect data regarding students' computer skills.	
	Collect data regarding students' academic achievement.	
	Collect staff development data on technology proficiencies.	
	Collect data regarding staff development focused on student computer knowledge and skills.	
	Collect data regarding staff development focused on integration of technology into the curriculum to improve academic achievement.	
	Use collected data to monitor and evaluate progress toward benchmarks and the timeline and to plan and make modifications.	

Sample Implementation Timeline

Start Date (M/Y)	Completion Date (M/Y)		Activity or Benchmark	Target Audience	Person Responsible	Component
	Projected	Actual				

Note: It is more useful to indicate actual start and/or completion dates rather than indicating "ongoing" in the date column.

Sample Sustainability Chart

Define the school district's role in sustaining the technology over the next three to five years.

Type of Support Provided (Examples)	Individual(s) Responsible (Person(s) or Job Title(s))	Plan for Providing This Support
Ongoing equipment maintenance, repair, and replacement		
Technical support provided during school hours		
Technical support outside school hours		
Professional development		

Sample Budget Form: Object of Expenditure

School Year _____

Major Object of Expenditure Categories	Partner Contributions (a)	Specific Grant Funds (Add multiple columns if receiving multiple grants) (b)	School District General Fund (c)	Total Funds by Object of Expenditure (a)+(b)+(c)
1000-1999 Certificated Personnel Salaries				
2000-2999 Classified Personnel Salaries				
3000-3999 Employee Benefits				
4000-4999 Books and Supplies				
5000-5999 Services and Other Operating Expenditures				
Indirect Costs at an Established Rate (excluding the 6000- 6999 category)				
6000-6999 Capital Outlay				
Total Funds				

Sample Budget Form: Budget Narrative

School Year _____

Line Item Category	Description
1000-1999 Certificated Personnel Salaries	
2000-2999 Classified Personnel Salaries	
4000-4999 Books and Supplies	
5000-5999 Services and Other Operating Expenditures	
6000-6599 Capital Outlay	

Checklist of Components

Use this checklist to determine whether the school district's education technology plan includes all the components necessary for student-centered learning.

Curriculum

- ☐ Does this component include clear goals and a realistic strategy for using telecommunications and technology to improve teaching and learning as described in the district's comprehensive improvement plan?
- ☐ Does the component include a timeline and benchmarks for implementing the strategies?

Professional Development

- ☐ Does this component define the professional development needs of teachers, administrators, and technical support staff so that the strategies for using telecommunications and technology to help students meet content standards can be implemented and the curricular goals can be achieved?
- ☐ Does the technology plan include a timeline and benchmarks for implementing the planned strategies?

Infrastructure, Hardware, Technical Support, and Software

- ☐ Does this component include a timeline and detailed list of the infrastructure, hardware, technical support, and software needed to support implementation of the plan?
- ☐ Does the component include a timeline and benchmarks for obtaining the identified infrastructure, hardware, technical support, and software?

Funding and Budget

- ☐ Does this component include a budget that identifies the costs and potential funding sources for supplying the infrastructure, hardware, technical support, software, and professional development needed to support implementation of the plan?

Monitoring and Evaluation

- ☐ Does this component include a monitoring process that enables the school district to monitor implementation of the plan so that any necessary mid-course corrections can be made?
- ☐ Does this component include an evaluation process to determine the effect of plan implementation on student achievement?
- ☐ Are there people designated to take responsibility for monitoring and evaluation?
- ☐ Does the component include a regular schedule for monitoring and evaluation?

Appendix A
Legal Requirements Regarding School Improvement Planning

Several laws specify the content of written plans to improve schools. The requirements are as follows:

Public Schools Accountability Act

Under this Act schools are ranked on their Academic Performance Index (API). If a school is low in the rankings, the school will have an opportunity through the Immediate Interventions/Underperforming Schools Program to participate in a funded planning process in which the school assesses the learning needs of its students and prepares an action plan to improve their academic achievement. Although the express use of educational technology is not required, *Education Code* Section 52054(e) does require the following: "The school action plan shall focus on improving pupil academic performance, improving the involvement of parents and guardians, improving the effective and efficient allocation of resources and management of the school, and identifying and developing solutions that take into account the underlying causes for low performance by pupils." The thoughtful use of education technology can help in all of these areas. A local technology plan could be easily woven in to support the school action plan.

School-Based Coordinated Categorical Program

Under this program, the school site council at any school receiving categorical funding must prepare a school plan to meet the instructional needs and accommodate the learning styles of all students, including an annual budget to expend the categorical funding provided the site. The required contents of this plan are spelled out in *Education Code* Section 52853. As with the Immediate Interventions/Underperforming Schools Program, this plan does not specifically require the inclusion of the use of education technology.

Nonetheless, education technology needs to be considered when the school site council plans the "curricula, instructional strategies, and materials responsive to the individual needs and learning styles of each pupil." Additionally, a local technology plan could be easily woven in to support this school site plan because the required components of the school site plan are nearly the same as the components of the local education technology plans outlined in this guide.

Improving America's Schools Act

School districts receiving federal Title I funds were required in 1995 to develop five-year local improvement plans. These plans focus on five themes: Standards and Assessment, Teaching and Learning, Professional Development, Family and Community Partnerships, and Funding and Governance. Several themes specifically refer to the use of technology. Under Teaching and Learning, school districts consider how they will provide all students with the opportunity to use technology that enhances curriculum and instruction. Under Professional Development, the plan needs to enable teachers to develop further expertise in subject content, teaching strategies, uses of technologies, and other essential elements in teaching according to high standards.

Congress is considering legislation to revamp and reauthorize the Improving America's Schools Act. Therefore the planning requirement may change. The latest federal requirements for school planning are posted on the California Department of Education Web site <*www.cde.ca.gov/iasa/*>.

Appendix B
Information Literacy

There is no shortage of information in this Information Age. People are faced with diverse, abundant information choices—in their academic studies, in the workplace, and in their personal lives. Information is available through libraries, community resources, special-interest organizations, the media, and the Internet. Increasingly, information comes in unfiltered, unedited formats, raising questions about its authenticity, validity, and reliability. The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively.

This unprecedented deluge of information, combined with rapid developments in technology for storing, organizing, and accessing information, has led to the emergence of a new type of literacy—information literacy. To be information-literate, "a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information."[1]

An information-literate person is one who:

- Recognizes that accurate and complete information is the basis for intelligent decision making
- Recognizes the need for information
- Formulates questions based on information needs
- Identifies potential sources of information
- Develops successful strategies to search for information
- Accesses many sources of information, including computer-based and other technologies
- Evaluates information
- Organizes information for practical application
- Integrates new information into an existing body of knowledge
- Uses information in critical thinking and problem solving[2]

[1] *American Library Association Presidential Committee on Information Literacy.* Chicago: American Library Association, 1989.

[2] Christine S. Doyle. *Information Literacy in an Information Society: A Concept for the Information Age.* Syracuse, New York: ERIC Clearinghouse on Information and Technology, 1997.

Information literacy is not a subject unto itself. It crosses all disciplines, learning environments, and levels of education. The school library is a natural partner in the integration of information literacy because it, too, crosses all disciplines and levels. The California content standards provide a structure for students to learn, apply, and practice information literacy. While mastering content, students extend their investigations, become more self-directed, and assume greater control over their own learning. Students who are effective users of information and ideas are equipped to be learners for life. Ultimately, information-literate students are those who have learned *how* to learn while learning the *content* as defined by the standards.

Information literacy skills are embedded in the *English–Language Arts Content Standards* adopted by the State Board of Education. Selected standards pertaining to information literacy are shown in the following table.

Grade	Strand	English–Language Arts Content Standard
K	Reading	1.3 Understand that printed materials provide information.
1	Listening and Speaking	1.2 Ask questions for clarification and understanding.
2	Writing	1.1 Group related ideas and maintain a consistent focus. 1.3 Understand the purposes of various reference materials (e.g., dictionary, thesaurus, atlas).
3	Reading	2.1 Use titles, tables of contents, chapter headings, glossaries, and indexes to locate information in text. 2.6 Extract appropriate and significant information from the text, including problems and solutions.
	Writing	1.3 Understand the structure and organization of various reference materials (e.g., dictionary, thesaurus, atlas, encyclopedia).

Grade	Strand	English–Language Arts Content Standard
4	Reading	2.4 Evaluate new information and hypotheses by testing them against known information and ideas.
	Writing	1.5 Quote or paraphrase information sources, citing them appropriately. 1.6 Locate information in reference texts by using organizational features (e.g., prefaces, appendixes). 1.7 Use various reference materials (e.g., dictionary, thesaurus, card catalog, encyclopedia, online information) as an aid to writing. 1.8 Understand the organization of almanacs, newspapers, and periodicals and how to use those print materials.
5	Reading	2.1 Understand how text features (e.g., format, graphics, sequence, diagrams, illustrations, charts, maps) make information accessible and usable. 2.3 Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.
	Writing	1.3 Use organizational features of printed text (e.g., citations, end notes, bibliographic references) to locate relevant information.
6	Reading	2.1 Identify the structural features of popular media (e.g., newspapers, magazines, online information) and use the features to obtain information.
	Writing	1.4 Use organizational features of electronic text (e.g., bulletin boards, databases, keyword searches, e-mail addresses) to locate information. 2.3 Write research reports: a. Pose relevant questions with a scope narrow enough to be thoroughly covered. b. Support the main idea or ideas with facts, details, examples, and explanation from multiple authoritative sources (e.g., speakers, periodicals, online information searches). c. Include a bibliography.

Grade	Strand	English–Language Arts Content Standard
7	Reading	2.2 Locate information by using a variety of consumer, workplace, and public documents. 2.6 Assess the adequacy, accuracy, and appropriateness of the author's evidence to support claims and assertions, noting instances of bias and stereotyping.
	Writing	1.4 Identify topics; ask and evaluate questions; and develop ideas leading to inquiry, investigation, and research. 1.5 Give credit for both quoted and paraphrased information in a bibliography by using a consistent and sanctioned format and methodology for citations. 2.3 Write research reports: a. Pose relevant and tightly drawn questions about the topic. b. Convey clear and accurate perspectives on the subject. c. Include evidence compiled through the formal research process (e.g., use of a card catalog, *Reader's Guide to Periodical Literature*, a computer catalog, magazines, newspapers, dictionaries).
8	Reading	2.1 Compare and contrast the features and elements of consumer materials to gain meaning from documents (e.g., warranties, contracts, product information, instruction manuals). 2.6 Use information from a variety of consumer, workplace, and public documents to explain a situation or decision and to solve a problem.
	Writing	1.4 Plan and conduct multiple-step information searches by using computer networks and modems. 1.5 Achieve an effective balance between researched information and original ideas. 2.3 Write research reports: a. Define a thesis. b. Record important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize all perspectives on the topic, as appropriate. c. Use a variety of primary and secondary sources and distinguish the nature and value of each. d. Organize and display information on charts, maps, and graphs.

Grade	Strand	English–Language Arts Content Standard
9 and 10	Reading	2.1 Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.
	Writing	1.3 Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.
		1.4 Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
		1.5 Synthesize information from multiple sources and identify complexities and discrepancies in the information and the difference perspectives found in each medium (e.g., almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents).
		1.6 Integrate quotations and citations into a written text while maintaining the flow of ideas.
		1.7 Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook, The Chicago Manual of Style)*.
	Speaking	2.2 Deliver expository presentations….
11 and 12	Reading	2.3 Verify and clarify facts presented in other types of expository texts by using a variety of consumer, workplace, and public documents.
		2.6 Critique the power, validity, and truthfulness of arguments set forth in public documents; their appeal to both friendly and hostile audiences; and the extent to which the arguments anticipate and address reader concerns and counterclaims (e.g., appeal to reason, to authority, to pathos and emotion.)
		1.6 Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
	Writing	2.4c Explain the perceived reason or reasons for the similarities and differences in historical records with information derived from primary and secondary sources to support or enhance the presentation.

Information literacy skills are also embedded in the *History–Social Science Content Standards for California Public Schools, Kindergarten Through Grade Twelve* (2000).

Students in kindergarten through grade five demonstrate the following skills:

1. Students differentiate between primary and secondary sources.
2. Students pose relevant questions about events they encounter in historical documents, eyewitness accounts, oral histories, letters, diaries, artifacts, photographs, maps, artworks, and architecture.
3. Students distinguish fact from fiction by comparing documentary sources on historical figures and events with fictionalized characters and events.

Standards pertaining to information literacy as they appear in the *History– Social Science Content Standards* for kindergarten through grade five are shown in the following table:

Grade	History–Social Science Content Standard
K	K.4.1 Determine the relative locations of objects using the terms near/far, left/right, behind/in front.
1	1.5.3 Compare the beliefs, customs, ceremonies, traditions, and social practices of the varied cultures, drawing from folklore.
2	2.1.2 Compare and contrast their daily lives with those of their parents, grandparents, and/or guardians.
3	3.3.1 Research the explorers who visited here, the newcomers who settled here, and the people who continue to come to the region, including their cultural and religious traditions and contributions.
4	4.3.3 Analyze the effects of the Gold Rush on settlements, daily life, politics, and the physical environment (e.g., using biographies of John Sutter, Mariano Guadalupe Vallejo, Louise Clapp). 4.4.9 Analyze the impact of twentieth-century Californians on the nation's artistic and cultural development, including the rise of the entertainment industry (e.g., Louis B. Meyer, Walt Disney, John Steinbeck, Ansel Adams, Dorothea Lange, John Wayne).
5	5.2.2 Explain the aims, obstacles, and accomplishments of the explorers, sponsors, and leaders of key European expeditions and the reasons Europeans chose to explore and colonize the world.

Students in grades six through eight demonstrate the following skills:

1. Students frame questions that can be answered by historical study and research.
2. Students distinguish fact from opinion in historical narratives and stories.
3. Students distinguish relevant from irrelevant information, essential from incidental information, and verifiable from unverifiable information in historical narratives and stories.
4. Students assess the credibility of primary and secondary sources and draw sound conclusions from them.
5. Students detect the different historical points of view on historical events and determine the context in which the historical statements were made (the questions asked, sources used, author's perspectives).

Standards pertaining to information literacy as they appear in the *History–Social Science Content Standard*s for grades six through eight are shown in the following table.

Grade	History–Social Science Content Standard
6	6.1 Students describe what is known through archaeological studies of the early physical and cultural development of humankind from the Paleolithic era to the agricultural revolution. 6.6 Students analyze the geographic, political, economic, religious, and social structures of the early civilizations of China.
7	7.6 Students analyze the geographic, political, economic, religious, and social structures of the civilizations of Medieval Europe. 7.7 Students compare and contrast the geographic, political, economic, religious, and social structures of the Meso-American and Andean civilizations.
8	8.2 Students analyze the political principles underlying the U.S. Constitution and compare the enumerated and implied powers of the federal government. 8.3 Students understand the foundation of the American political system and the ways in which citizens participate in it.

Students in grades nine through twelve demonstrate the following skills:

1. Students distinguish valid arguments from fallacious arguments in historical interpretations.
2. Students identify bias and prejudice in historical interpretations.
3. Students evaluate major debates among historians concerning alternative interpretations of the past, including an analysis of authors' use of evidence and the distinctions between sound generalizations and misleading oversimplifications.
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.

Additional standards pertaining to information literacy appear in the *History–Social Science Content Standard*s for grades nine through twelve:

Grade	History–Social Science Content Standard
10	10.1 Students relate the moral and ethical principles in ancient Greek and Roman philosophy, in Judaism, and in Christianity to the development of Western political thought. 10.4 Students analyze patterns of global change in the era of New Imperialism in at least two of the following regions or countries: Africa, Southeast Asia, China, India, Latin America, and the Philippines.
11	11.3 Students analyze the role religion played in the founding of America, its lasting moral, social, and political impacts, and issues regarding religious liberty. 11.4 Students trace the rise of the United States to its role as a world power in the twentieth century.
12	12.1 Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy. 12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.

Appendix C
The Design Elements for High-Quality Professional Development

1. **Uses student performance and achievement data, including student feedback, teacher observation, analysis of student work and test scores, as part of the process for individual and organizational learning**

   Sources of data and information include the results and outcomes from multiple forms of assessment. In addition, information about the students' cultural context and learning history is included. The purpose of using a variety of data sources is for teachers to know their students well and then to use that knowledge to plan professional development that will increase students' learning.

2. **Uses a coherent, long-term professional development planning process connected to the school plan that reflects both site-based priorities and individual learning needs**

   Professional development planning is an ongoing process that is closely linked to other planning activities at the site—those that take place for Program Quality Review, Focus on Learning, school improvement, and various initiatives. Plans and initiatives are linked systematically and overlap with whole school goals. The planning process is ongoing, and changes are made as a result of teacher feedback and formative evaluation of teacher learning.

3. **Provides time for professional learning to occur in a meaningful manner**

   Time is the greatest stumbling block for providing relevant and timely high-quality learning opportunities for teachers—time to plan, reflect, design lessons together, and examine and make meaning of content and teaching standards. Teachers need time both on-site and away from school to pursue learning opportunities.

4. **Respects and encourages the leadership development of teachers**

   There are a variety of leadership roles for teachers: planning/governance at the site, mentoring new teachers, acting as consulting teachers, coordinating alliances and learning networks among teachers, developing curriculum, and advising district and state policymakers. The *California Standards for the Teaching Profession* (CSTP) and the *National Board for Professional Teaching Standards* (NBPTS) inform local districts about ways to develop leadership roles that will model high standards for teaching.

5. **Develops, refines, and expands teachers' pedagogical repertoire, content knowledge, and the skill to integrate both**

   Professional development strategies such as workshops, institutes, networks, and academies, as well as job-embedded activities, are related to the *California Standards for the Teaching Profession* (CSTP) and are helpful in closing the achievement gap between the highest- and lowest-performing groups of students.

6. **Provides for and promotes the use of continuous inquiry and reflection**

   Through inquiry and reflection, teachers come to understand content standards, self-assess their teaching with respect to the *California Standards for the Teaching Profession* (CSTP) and examine beliefs and assumptions that impede their success with students. Strategies for ongoing inquiry and reflection include participating in action research, creating teaching portfolios, keeping journals, examining student work and student data, reflecting with a colleague or coach, and conducting studies of individual students.

7. **Provides for collaboration and collegial work, balanced with opportunities for individual learning**

   A collaborative learning culture is central to the professional development enterprise and is characterized by activities such as study groups, joint planning and problem solving, peer coaching, interdisciplinary or team teaching, and shared learning from off-site trainings or from participation in alliances and

networks. All of these activities are ongoing and help individual teachers address their personal learning plans and, at the same time, extend the learning to others at the site.

8. **Follows the principles of good teaching and learning, including providing comfortable, respectful environments conducive to adult learning**

   The conditions that support powerful learning for adults include attending to what is learned, how it is learned, and where it is learned. The Concerns-Based Adoption Model (CBAM) is one strategy for determining teachers' levels of concern and, subsequently, designing appropriate learning strategies.

9. **Creates broad-based support of professional development from all sectors of the organization and community through reciprocal processes for providing information and soliciting feedback**

   Partnerships with parents, community members, and institutions and agencies in the broader community can provide important resources for teachers and administrators. Understanding and support for professional development, both within the educational community and with the public, can be built through communication, information sharing, and mutual respect and trust.

10. **Builds in accountability practices and evaluation of professional development programs to provide a foundation for future planning**

    Evaluation of professional development programs at the school site are conducted within a framework that includes data and knowledge about students (Design Element 1), reference to the overall school plan and goals (Design Element 2), and existing state and district policies and resources (Design Element 9). Program evaluation is also referenced against teaching standards and student content standards. Every aspect of teacher learning is linked to student learning.

Appendix D. Levels of Proficiency in Technology Skills

(Required for Preliminary Teaching Credentials)

Levels of General Computer Skills			
	Introductory	**Intermediate**	**Proficient**
General knowledge of basic hardware and software terminology G1	A. Identifies hardware components, peripherals, and their purpose B. Identifies icons, windows, and menus	C. Uses icons, windows, and menus D. Uses basic peripherals (e.g., CD-ROM, storage media, etc.)	• Incorporates general knowledge of basic hardware and software into lesson design as appropriate (e.g., vocabulary, naming and saving conventions, printing, etc.)
Knowledge of the operation and care of hardware G2	• Starts up and shuts down computer and peripherals • Uses a mouse • Inserts and ejects diskettes, CD-ROM, etc. • Uses software from a disk, hard drive, or CD-ROM • Creates, names/renames folders and files • Starts an application and creates a document • Names, saves, saves as, retrieves and revises a document • Prints documents	• Organizes the desktop • Initializes, formats, and names diskettes • Copies documents between computer and diskettes • Chooses printer location	• Allocates memory needed by applications • Accesses and changes control panels • Sets software preferences • Makes more system memory available • Performs regular maintenance • Organizes files and programs • Uses print preview and options • Opens and works with more than one application at a time • Shares files and printers on a network • Installs software • Selects and uses appropriate anti-virus software
Knowledge of basic troubleshooting techniques G3	• Restarts a frozen computer • Identifies directly connected or networked printer problems	• Troubleshoots basic hardware, software, and printing problems before accessing the appropriate level of support • Checks cables for proper attachment • Solves simple printer problems with directly connected printer	• Troubleshoots common hardware, software, and printing and network problems before accessing the appropriate level of support
Integration, student learning, and classroom management G5		• Explains various models for classroom management of technology • Cites examples of appropriate applications of technology as an educational tool	• Selects and uses effective classroom management techniques using technology in a limited number of educational settings • Selects and implements appropriate technology tools to support teaching and learning processes

Rubrics developed by the California Technology Assistance Project (CTAP) in January 2000.

Levels of User Expertise on the Internet			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware and software (e.g., Web browsers and connections) G1, G5	• Launches a browser and uses the toolbar • Specifies a URL and can point and click to navigate on existing links • Changes window sizes • Views history • Accesses help file • Explains basic Internet terminology • Accesses the Internet through a modem or network	• Explains the anatomy of a URL • Configures preferences for software • Sets a homepage • Refreshes or reloads a page • Hides, displays, or configures the toolbar • Locates and opens a local file within the browser • Copies, pastes, and saves from web pages • Downloads files • Configures page setup to print citation resources	• Selects helper files/applications used to open downloaded files • Maintains and organizes favorite bookmarks • Troubleshoots address errors (i.e., 404 errors) • Uses and manages multiple windows
Communication collaboration S3, S4	• Explains use of e-mail as a means of communication	• Uses e-mail to communicate with members of a group	• Uses chat rooms, newsgroups, or threaded discussions to communicate with members of a group
Research tools S7	• Conducts basic searches	• Explains the differences between search indexes, search engines, and metasearch tools • Understands Boolean logic • Conducts natural language searches	• Uses advanced search features • Conducts multiple search strategies to locate and validate information • Uses Internet search engines as a resource for lesson development
Ethics and policies G4, S13, S14		• Explains issues surrounding Internet use in the classroom (e.g., copyright, management, student safety, AUP, etc.)	• Implements procedures and management techniques concerning Internet use in the classroom for instruction
Information literacy S5, S8	• Evaluates information for accuracy • Identifies whether a source is credible	• Organizes information • Analyzes and interprets information	• Uses a wide variety of sources • Filters information for relevancy • Incorporates information literacy strategies into lesson design
Integration, student learning, and classroom management S6, S9–S12		• Locates resources appropriate for integrating technology into lesson design	• Selects and uses Internet resources appropriately in lesson design • Selects and uses effective classroom management techniques

Levels of User Expertise with E-mail			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware, software G1, G5	• Explains telecommunications terms • Explains the three main components of an e-mail address	• Configures e-mail preferences • Attaches, receives, and opens attachments • Creates and uses an address book • Recognizes and uses embedded Web links	• Manages an address book • Locates, opens, and manages attached files
Communication and collaboration S3, S4	• Starts up program, retrieves, and reads e-mail • Saves, prints, and deletes e-mail • Composes, edits, and sends new e-mail	• Uses reply to sender, reply to all, and forwarding functions appropriately • Uses cc and bcc to communicate with one person or a few people	• Employs e-mail to communicate with and provide information to students, parents, and community members
Integration, student learning, and classroom management S6, S9-S12	• Explains procedures and processes for use of e-mail in the classroom	• Describes use of e-mail in the classroom for connecting with others, such as keypals, global classrooms, parallel problem-solving, mentoring, etc.	• Designs curricular lessons that utilize e-mail as a part of the activity • Selects and uses effective classroom management techniques using e-mail in a limited number of educational settings • Selects and uses appropriate e-mail tools to support teaching and learning
Legal and ethical issues G4, S13, S14	• Explains "netiquette" • Explains issues surrounding student safety and security	• Practices appropriate "netiquette" related to e-mail • Follows up on issues related to personal safety and security	• Incorporates "netiquette" in classroom instruction • Follows student safety and security procedures in instruction

Levels of Word Processing Skills			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware and software G1, G5	• Identifies word-processing terms (e.g., word processing, cursor, styles, etc.) • Opens, saves, prints, and deletes a document	• Navigates in a large document • Accesses and uses help • Previews document to identify layout problems • Uses basic proofing tools to detect errors (e.g., spellcheck, grammar check)	• Finds and replaces text • Saves word-processing documents in other file formats • Retrieves documents with the find file command
Communicate through printed media S2	• Types, selects, corrects, and deletes text • Adjusts tabs and margins • Applies and changes font, characters, and paragraph formats • Changes on-screen view mode and magnification	• Copies and pastes text within and between documents • Uses styles to change the appearance of paragraphs and outlines • Uses templates • Applies borders • Creates numbered and bulleted lists • Adds and deletes page breaks and creates headers and footers • Creates tables using built-in software assistance	• Uses word processors to create lesson plans, articles, reports, etc. • Enhances documents by inserting graphics • Incorporates drawing tools • Resizes and relocates graphics within a document • Creates templates • Formats text in columns with different fonts and colors
Integration, student learning, and classroom management S6, S9-12		• Transcribes handwritten documents into word-processed documents • Creates a simple word-processed document	• Creates enhanced word-processed documents for classroom use • Designs lessons that utilize word-processing as part of the activity

Levels of User Expertise in Desktop Publishing			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware and software G1, G5	• Defines publishing terms (e.g., page layout, stories, fields, etc.) • Opens, saves, prints, and deletes a document	• Navigates in a large document • Accesses and uses help • Previews document to identify layout problems • Uses basic proofing tools to detect errors (e.g., spell check, grammar check)	• Finds and replaces text • Saves text documents in other file formats
Communicates through printed media S2	• Creates a new document • Changes document setup • Copies, cuts, and pastes text and graphics • Changes on-screen view mode and magnification • Incorporates clip art • Changes typefaces, font size, and other text attributes • Changes text alignment/justification • Identifies types of publishing software (e.g., word processing, page layout, image/graphic, etc.) • Undo unwanted changes	• Imports/ places and resizes graphics, (e.g., clip art, charts, auto-shapes, etc.) both as objects and as type • Uses suitable size, style, and number of fonts • Creates a simple shape graphic • Controls text flow around graphics • Moves, arranges, and layers objects • Creates numbered and bulleted lists • Uses guides and rulers • Creates multiple columns with text • Controls page numbering • Changes page tabs, margins, and indents • Edits line and shape style and fill properties • Creates and modifies headers and footers	• Understands elements of basic design (e.g., white space, page layout, etc.) • Saves documents in appropriate formats • Integrates various and appropriate software for desktop publishing (e.g., graphics, layout, etc.) • Incorporates digital images from external sources (e.g. cameras, scanners, Internet)
Integration, student learning, and classroom management S6, S9-S12	• Describes various types of publishing media and possible classroom applications	• Selects media to support instructional objectives	• Develops student assignments that embed elements of effective design • Plans for effective classroom management of available resources

Levels of User Expertise in Databases			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware, software G1, G4, G5	• Defines database terms (e.g., records, fields, etc.) • Creates, opens, and saves a database • Selects, moves, copies, deletes, clears, and inserts fields and records	• Formats fields to reflect appropriate data (e.g., date, name, currency, etc.) • Explains differences between report and query/search/find • Uses print preview to identify print problems	• Finds and replaces data • Sorts, matches, and goes to specific records • Exports data from database • Adds header and footer
Manage records (e.g., grade book, attendance, etc.) S1	• Enters text and data into appropriate fields	• Uses find command to locate a specific record • Creates or modifies report layout	• Merges database information with word processing document to produce form letters
Communicate through printed media S2	• Sorts data to produce reports (e.g., alphabetical listings, etc.) • Formats text and numbers in record (e.g., boldface, currency, etc.)	• Creates a variety of report layouts • Sorts or defines data to print only required records (e.g., students reading at grade level)	• Imports data from other applications • Creates new layouts or edits existing layouts for specific productivity or curricular goals
Integration, student learning, and classroom management S6, S9-12	• Describes the educational uses of databases	• Identifies lessons that require the manipulation of data • Creates new databases related to content area (e.g., world populations, animal data, etc.)	• Designs curricular lessons using databases to enhance learning outcomes • Develops student assignments that require management and manipulation of a variety of data

Levels of User Expertise in Spreadsheets			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware, software G1, G5	• Defines spreadsheet terms (e.g., cells, alignment, formula, etc.) • Creates, opens, and saves spreadsheets • Navigates using the mouse and tabs • Undo unwanted changes • Locates cells based on column/row addresses • Selects, moves, copies, deletes, clears, and inserts cells • Selects entire column or row • Resizes cells and rows • Changes typeface, font size, and other cell attributes	• Sorts cells • Changes text cell alignment and justification • Replicates a formula or range of cells (e.g., fill down, fill right) • Creates simple bar graphs or pie charts • Adds shading and borders • Selects charts for appropriate data representation	• Saves in a variety of formats • Imports/exports charts and data (e.g., spreadsheet to word processing, etc.) • Aligns and rotates text and numbers • Creates a variety of charts • Labels graphs appropriately
Manage records (e.g., grade book, attendance, etc.) S1	• Enters text and data into specific cells	• Creates formula cells (e.g., sum, average, etc.) • Formats cells for appropriate content such as text, decimal alignment, currency	• Utilizes grade book templates • Maintains student records
Communicate through printed media S2	• Adjusts layout and margins • Uses print preview and print document with title • Creates and edits headers, footers, and page numbers • Sets up print options for grid lines, zoom, etc.	• Prints a specific range of cells, pages, and sheets • Searches for and replaces text • Changes size, placement, and title of charts • Changes margins	• Imports/exports charts into word-processing application
Integration, student learning, and classroom management S6, S9-12	• Describes the educational uses of spreadsheets	• Creates new spreadsheets related to content area	• Designs curricular lessons requiring use of spreadsheet • Creates appropriate charts for a content lesson

Levels of User Expertise in Presentation Software			
	Introductory	**Intermediate**	**Proficient**
General knowledge and appropriate use of hardware, software G1, G5	• Defines presentation and multimedia terms (e.g., slides/cards, slide show, hyper-navigation, etc.) • Creates, opens, modifies, and saves presentations • Defines available tools (e.g., drawing, text, etc.) • Uses templates or wizards to create a new presentation • Adds new slides or cards • Inserts text, formats text, or adds text box • Uses toolbar or menus to apply formatting changes • Inserts clip art or digitized pictures	• Inserts or changes slide or card design • Navigates using scrollbar, slide sorter, menu, key commands, etc. • Switches between different page views • Rearranges the order of slides or cards • Applies backgrounds and objects appropriately • Uses available tools (e.g., drawing, text, etc.) • Incorporates sound • Defines different image types (i.e., TIFF, GIF, PCX) • Connects, configures, and troubleshoots peripheral devices for presentation	• Creates and edits navigational buttons to move through presentation • Navigation through presentation is clear and easy to understand. • Applies transitions and effects, if appropriate, to slides or cards • Incorporates hypertext links • Incorporates animations from library • Incorporates movies from library • Records sound and inserts in presentation • Incorporates clip art from other sources (e.g., Internet, scanner, etc.) • Organizes presentation resources in a folder on the desktop or server • Edits clip art (if appropriate)
Communicates through print media S2	• Prints slides	• Demonstrates understanding of basic design elements (i.e., color, design, space, and composition) • Prints using advanced printing options	• Prints handouts that enhance instructional objectives (e.g., outlines, notes, etc.)
Integration, student learning, and classroom management S6, S9-12	• Describes the educational uses of presentation software	• Organizes information in a clear, consistent way for the viewer • Creates cards or slides using effective design to enhance communication • Uses appropriate background and text colors to ensure clarity and readability	• Designs curricular lessons having multimedia to enhance learning outcomes • Follows fair use and copyright laws for text, graphics, and sound

Levels of User Expertise in Instructional Technology			
	Introductory	**Intermediate**	**Proficient**
Analyzes best practices and research findings G5, S12	• Locates learning, teaching, and communication resources related to implementation in the classroom	• Is able to locate and adapt lessons based upon best practices and research findings	• Analyzes best practices and research findings on the use of technology and designs lessons accordingly
Considers content to be taught and selects the best tech resources to support, manage, and enhance learning S5, S10	• Identifies established criteria used to evaluate digital media • Receives examples of lesson plans that integrate technology • Identifies process used to match technology with content	• Practices evaluating educational digital media using established criteria • Practices including appropriate technological resources in classroom lesson plans	• Evaluates educational digital media using established criteria • Includes appropriate technological resources in classroom lesson plans
Identifies student learning styles and determines appropriate resources S6, S9	• Is aware of learning style inventories for students • Examines a variety of technology resources for their applicability to learning styles	• Selects and uses activities to identify student learning styles • Uses a variety of technology resources in lesson plans suited to student learning styles	• Integrates appropriate technology resources and adapts lessons and classroom practice according to learning style inventory results
Demonstrates ability to create and maintain effective learning environments using computer-based technology S11	• Describes various models of technology use that enhances learning and increases efficiency and productivity	• Uses teacher productivity tools for classroom management (e.g., home-school communication, student records and grades) • Lesson plans reflect a management system for computer-based activities	• Effectively uses technology for whole-class, small group, and individual instruction • Designs classroom activities that allow all students to build upon their technology skills and increase learning • Implements management procedures that support assessment of student involvement and achievement
Demonstrates knowledge of privacy, security, and safety issues G4, S13, S14	• Explains the need for and use of copyright policy, protection of student privacy, security, and safety	• Implements established policies for safe, private, and secure practices in personal work • Personally implements established policies about copyright and plagiarism	• Implements established policies for safe, private, and secure practices in classroom • Implements policies about copyright and plagiarism in classroom

Appendix E. Matrix of Professional Teachers' Proficiency in Computer-Based Technology

Communication and Collaboration		
Factors to Consider	**Professional Profile**	**Performance Indicators**
Communicates through a variety of electronic media P2	• Identifies, selects, and uses digital communication tools appropriately. • Uses digital tools to communicate with students, parents, and community members to enhance management and learning	• Evidence of the use of a variety of communication tools based on resources available (e.g., telephone, e-mail, fax, listserv or Web page) • Evidence of the management of information using technology to increase communication, (e.g., Web pages, voice mail, homework hotlines)
Interacts and collaborates with others using computer-based collaborative tools P3	• Supports student learning through collaboration with parents, subject matter experts, educators, and others using digital tools • Participates in professional growth activities by using digital communication tools	• Evidence of sustained communication with parents, students, and/or colleagues through mailing lists, video conferencing, online staff development, shared network folders, etc. • Student projects utilize digital tools to interact with subject matter experts. • Lesson/activity plans are designed collaboratively using appropriate communication tools as a medium (e.g., e-mail, listserv, shared network folders, mailing lists, video conferences, etc.).
Collaborates with other teachers, mentors, librarians, resource specialists, and other experts to support technology-enhanced curriculum P11	• Uses digital communication tools to work with educators and subject matter experts to design classroom activities to support student learning • Seeks out and draws upon the expertise of others to support the learning process and technology-enhanced curriculum	• Student work that exemplifies evidence of active collaboration with outside experts • Interdisciplinary lessons and cross grade-level projects (see also Planning, Designing, and Implementing Learning Experiences, P5)
Contributes to site-based planning or local decision making regarding the use of technology and acquisition of technological resources P12	• Provides leadership by participating in schoolwide decision-making and learning activities that support learning through the use of technology • Actively contributes to the development or updating of site or district-based technology plans • Explores new technologies and recommends innovative educational applications appropriate to the curricular needs of the students and site	• Participation in grade-level or department activities to develop a school site technology plan • Pursues continuing education (e.g., educational technology, conference attendance, curriculum integration, online courses workshops) • Evidence of active participation in the site or district decision-making process regarding the use and acquisition of technology (e.g., grade-level technology committee, technology planning)

Planning, Designing, and Implementing Learning Experiences		
Factors to Consider	**Professional Profile**	**Performance Indicators**
Demonstrates competence in evaluating the authenticity, reliability, and bias of data gathered; determines outcomes and evaluates the success or effectiveness of the process used P4	• Evaluates authenticity, accuracy, reliability, and bias of resources to be used in the planning and designing of instructional activities • Identifies the process used to evaluate data and determines the success or effectiveness of that process • Applies information literacy competencies in professional practice	• Research on curricular resources incorporates multiple references from a variety of credible electronic and traditional sources. • Evidence of self-reflection and evaluation on the outcome and success of the process used through anecdotal records, self-reflections, journals, and lesson plan revisions
Optimizes lessons based upon technological resources available in a variety of learning locations P5	• Applies best practices and research findings on the use of technology in managing resources for specific student populations • Analyzes the needs of students and organizes appropriate and available technological resources for curricular applications • Establishes technology procedures and routines that engage all students in a variety of learning environments	• Classroom activities reflect the availability of technology tools and resources at site, community, and home. • Lesson activities use appropriate technology resources based upon specific student needs (e.g., drill and practice, simulation, video-based instruction). • Lesson activities reflect access to a variety of learning locations (e.g., one computer room, computer lab, multiple workstations in a room, and portable technologies).
Designs, adapts, and uses lessons that develop student information literacy and problem-solving skills as tools for lifelong learning P6	• Implements lessons that engage students in evaluating information, problem solving, and critical thinking to make subject matter meaningful • Facilitates activities that engage students to become self-directed learners through effective use of technology aligned with curriculum standards • Incorporates lessons using appropriate technological and traditional tools for student research, data gathering, analysis, and presentation	• Student research projects incorporate multiple references from a variety of credible electronic and traditional sources. • Student methods of utilizing valid information are analyzed for success (e.g., rubrics, student reflection, and/or bibliographic cross referencing). • Evidence that improvements to future student activities are planned (See also Assessment and Evaluation, P10) • Lesson plans indicate activities to maximize student learning by matching the most appropriate technology resources to instructional and learner needs.
Creates or makes use of learning environments inside the classroom, as well as in library media center or computer labs, that promote the effective use of technology aligned with curriculum P7	• Selects appropriate technology that supports state academic content standards • Implements effective classroom management techniques using technology in a variety of educational settings • Employs a variety of technology-based instructional strategies to enhance learning (e.g., direct, cooperative, individual, etc.) • Supports varying learning styles and modalities by integrating a variety of technological resources in lesson design for all students	• Sample technology-integrated lessons are clearly aligned with state academic content standards • Evidence of lessons that provide for equal access to technological resources for all students in a variety of locations • Sample technology-integrated lessons use technology appropriately.

Planning, Designing, and Implementing Learning Experiences		
Factors to Consider	**Professional Profile**	**Performance Indicators**
Uses technology in lessons to increase each student's ability to plan, locate, evaluate, select, and use information to solve problems and draw conclusions P8	• Engages students in the process of planning, locating, and evaluating information obtained by using technology • Designs technology-infused lessons to increase student's critical-thinking skills • Facilitates technology-infused experiences that promote autonomy, interaction, and choice • Incorporates instructional strategies to develop student skills for assessing validity and reliability of information	• Evidence of lessons that provide engaging activities for students to evaluate information, solve problems, and draw conclusions • Student projects demonstrate student's increased ability to plan in order to select and use information. • Models the use of technology to plan activities for solving problems and drawing conclusions
Demonstrates knowledge and understanding of the legal and ethical issues concerned with the use of computer-based technology G4, S13, S14	• Translates the school's acceptable-use policy (AUP) into understandable rules and procedures for students • Demonstrates and advocates legal and ethical behaviors for students and colleagues regarding the use of technology and information	• Models, teaches, and reinforces intellectual property rights and acceptable-use policies • Evidence that students are following the acceptable-use policy • Evidence of lessons that include copyright and policy citations • Student reports include appropriate bibliographic information.

Assessment and Evaluation		
Factors to Consider	**Professional Profile**	**Performance Indicators**
Uses computer applications to manipulate and analyze data P1	• Collects, organizes, and analyzes data using technology for the purpose of managing resources, learning environments, and project design • Uses technology to collect and analyze data for school instructional planning	• Evidence of the use of a gradebook spreadsheet or database program to record and report student progress • Instruction is modified based on the analysis of student mastery of data by using district-adopted student information system. • Evidence of the use of assessment tools and strategies to evaluate student activities • Customized documents for school planning use technology tools.
Uses technology to assess student learning and provide feedback to students and parents P9	• Devises project assessments that allow students and parents to monitor progress and adapt educational activities appropriately • Produces individualized learning reports of students • Shares learning reports with students and parents to provide feedback to improve purposeful student engagement in learning • Collects, interprets, and reports student performance data using technology	• Evidence of the use of electronic means to collect student data (e.g., gradebooks, web-based testing, computer-aided instruction, etc.) • Presentations are produced for a variety of audiences to illustrate student performance. • Evidence of the use of technology to create individual learning reports for parents and students
Frequently monitors and reflects upon the results of using technology in instruction and adapts lessons accordingly P10	• Analyzes the effects of technology integration on student learning and modifies lessons to better meet curricular goals • Uses technology tools to collect and analyze student data to effectively manage instruction and classroom management • Analyzes best practices and research findings on the use of technology and designs lessons accordingly	• Plans identify, manage, and organize resources available for appropriate student use. • Portfolio of progressive lesson plans indicates more effective use of technology in alignment of best practices and research findings. • Evidence of reflection on the process of monitoring, analyzing, and modifying the effective use of technology in lessons

Glossary

acceptable-use policy. A policy that contains provisions for student use of the Internet and network in a school district and is written as a contract between the parent and student and the school.

application program. Computer program that accomplishes a specific task, such as word processing or processing of payroll data.

assistive technology. Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability.

backbone. A high-speed line or series of connections that forms a major pathway within a network.

backup. A system, device, file, or facility that can be used as an alternative in case of a computer malfunction or loss of data.

bandwidth. The amount of data that can be sent through a given connection per second.

camcorder. A self-contained videotape recording device whose signals can be recorded live through the attached lens or through a standard video or antenna signal.

CLRN. The California Learning Resources Network is a statewide education technology service that reviews electronic learning resources for alignment with the state content standards; provides sample lesson plans to show how to use electronic learning resources; and includes a searchable Web site and links to other statewide education technology services. The Web site is at *www.clrn.org.*

computer-assisted instruction (CAI). Software that makes the computer an instructional tool for drill and practice, tutorials, simulations, or educational games.

compression. A digital process that reduces the bandwidth or bits necessary to encode information; saves transmission time or capacity.

courseware. Software used in the teaching and learning process to instruct students in a particular curriculum area.

CSIS. The California School Information Services is a professional association that has three functions:

(1) Builds capacity of local educational agencies (LEAs) to implement and maintain comparable, effective, and efficient student information systems that will support the daily program needs of LEAs and promote the use of information for educational decision making by school-site, district office, and county office of education staff.

(2) Enables the accurate and timely exchange of student transcripts between LEAs and to postsecondary institutions.

(3) Assists LEAs in transmitting state reports electronically to the California Department of Education, thereby reducing the reporting burden of LEA staff.

Note: A resource that provides an online glossary of terms and acronyms used in technology may be found at *www.whatis.com.*

CSLA. California School Library Association.

C-SMART. This statewide education technology service helps districts and schools get the best prices for hardware, software, and other electronic learning resources; works with the Department of General Services on group purchase pricing; and negotiates discount pricing or statewide licenses. The Web site address is *www.c-smart.org.*

CTAP. The California Technology Assistance Project provides regional technology services to school districts through 11 regional offices. The Web site address is *http://www.cde.ca.gov/ctap.*

CUE. A professional association called Computer-Using Educators.

curriculum integration. The relationship between existing curriculum and technology-based instructional materials; ideally the technology-based resources may be incorporated into the curriculum without requiring drastic changes in the content, teaching methods, or curriculum objectives.

DCP. The Digital California Project is a project spearheaded by institutions of higher education to develop a high-speed K-20 network. The Web site address is *http://www.cenic.org.*

desktop publishing. The use of computer software to integrate text with charts and pictures and to design, display, and print high-quality documents comparable to typeset print.

dial-up Internet connection. A method of allowing a user to dial an Internet service provider by using a computer with a modem and a telephone line to access the Internet.

digital video. Motion pictures and sound displayed on a computer's monitor from data stored on the computer's hard drive, a CD-ROM, or on a network file server. The data consist of a sequence of numbers that are stored on a file; data can be manipulated and displayed by a computer.

DVD. A digital video disc is used to store music, films, or software.

distance learning. A method of learning in which students at one site use telecommunications to receive instruction delivered from another site.

display projection panel. A large screen in front of the classroom displaying the image received from a computer. The image on the panel enlarges the one seen on a computer monitor for whole-class instruction.

e-mail. Electronic mail messages sent by one computer to another person's electronic mailbox for later retrieval.

Ethernet. A kind of local area network widely used because it can network a wide variety of computers.

FAX. Transmission or reception of a facsimile printed page between two locations connected via telecommunications.

fiber optics. A cable made of a hollow fiber of glass through which a large amount of data can be transmitted or received.

firewall. A combination of hardware and software that separates a LAN into two or more parts for security purposes.

full-motion video. A video playing at the rate of 30 frames per second.

groupware. License from a software company (site license) allowing a group to use a single copy of a program/application on more than one machine.

hardware. A computer or other piece of technological equipment.

IASA. Improving America's Schools Act.

IEP. Individualized education program; primarily designed for the education of special education students.

information literacy. The ability to access, evaluate, and use information from a variety of sources.

interactive. Pertaining to an application or system in which an entry elicits a response from the user.

Internet. The global "network of networks"; it is the information highway on which users send and receive e-mail, log in to remote computers (Telnet), browse databases of information, and send and receive programs contained on these computers. No organization has control or jurisdiction over it.

Internet service provider (ISP). A company that provides other companies or individuals with access to, or a presence on, the Internet.

LAN. A local area network is a system for linking terminals, programs, storage, and graphic devices at multiple workstations over relatively small geographic areas.

laser disc. Digital storage medium written and read by laser.

laser printer. A nonimpact printing device that places images on a rotating drum by using a laser beam.

LIP. Local improvement plan.

listserv. A topic-oriented, e-mail-based message system in which users subscribe to desired lists to receive and post messages.

local printing. Printing to a device that is connected directly to the user's computer.

log in/log out. Procedures for initiating and terminating a session on a networked server.

menu. A list of available operations, allowing the user to select the desired operation by using either a mouse or the keyboard.

modem. Acronym for MOdulator-DEModulator; a device that modulates and demodulates signals transmitted over communications facilities.

multimedia. The use of more than one medium in a program or system; combines multiple forms of media, such as audio, video, graphics, animation, and full-motion video.

network. A system typically composed of one or more servers and multiple workstations that links computers together.

network printer. A printer compatible with a personal computer that is attached to a network and rendered available for use from any workstation on the network.

online reference. Materials that are accessed by electronic means (modem, CD-ROM).

operating system. Software that controls the operation of other programs; may provide services such as resource allocation, scheduling, input/output.

PC. Personal computer.

peripheral equipment. Equipment that can communicate directly with a computer, such as printers, CD-ROMs, and laser disc players.

platform. The operating system of a computer system (e.g., DOS, UNIX, Mac).

prompt. Message or symbol that appears on the screen, asking for information from the user.

RAM. Random access memory is the memory available to the user for program execution.

router. A device that selects the most effective travel path in a network and routes information accordingly.

ROM. Read-only memory is the operating system memory. A storage device built into the hardware and that cannot be altered by the user.

scanner. A device used to translate print media into computer language so that a document can be viewed and later read on the computer screen.

search engine. Software that retrieves information on user-specified parameters.

serial port. A connector for peripheral devices, such as modems, laser disc players, and VCRs, that sends and receives one bit at a time.

server. A computer that provides some service for other computers connected to it via a network. The most common example is a file server that has a local disc and services requests from remote clients to read and write files on that disc.

server configuration. The hardware required for or installed in a personal computer used as a network server.

site license. See *groupware*.

software. The programs used with a computer to perform tasks such as word processing or accounting. The term was coined to contrast with the hardware of a computer system.

spreadsheet. A computer program that turns a computer terminal into a huge ledger sheet with large columns and rows of numbers that change according to parameters determined by the user.

storage. Device, or part of a device, that can retain data; memory.

streaming. A method of transmitting live or stored audio or video over the Internet.

system operator. Person or persons assigned to operate and maintain a host computer in the school district.

teacher workstation. A desktop or laptop computer and related peripherals, such as a printer, display projection panel, and overhead projector to provide tools for classroom presentations and classroom management.

technology. The tools and machines used to perform tasks efficiently. In education, it is the most appropriate equipment and application to support or accomplish teaching and learning. Such equipment includes but is not limited to computers, networked thin-client units, television sets, videos, microscopic cameras, computer-based laboratories, interactive white boards, digital cameras, personal digital assistants (PDAs), and calculators. Technology is one means by which people improve their surroundings.

telecommunications. Vast array of electronic systems for communicating information over distances.

thin client. A low-cost, centrally managed device without a CD-ROM player, diskette drive, or expansion slots, that functions as a computer when connected to a network. The applications and Internet access provided through the thin client all reside on the network.

TICAL. The Technology Information Center for Administrative Leadership is a statewide education technology service that helps school district and site administrators to be effective leaders of "digital schools." It provides a one-stop, online technology information center with resources and solutions for administrators. The Web site address is *www.portical.org*.

total cost of ownership. The true cost of hardware purchases, including the cost of infrastructure, software, staff development, and technical support necessary to use the hardware, in addition to the purchase price or lease cost of the hardware.

URL. A uniform resource locator is the standardized direction given to a browser to locate a homepage or Web site.

user ID. String of keyboard characters that uniquely identifies a user to the computer system and allows him or her access to the network.

WAN. A wide area network links computers over a physical distance that is larger than that of a local area network (LAN).

Web browser. Programs serving as a graphical interface to the World Wide Web.

word processing. The production of typewritten documents through automated and usually computerized typing and text-editing equipment.

workstation. Personal computer equipment utilized by an individual.

www. The World Wide Web allows users to browse at thousands of sites on the Internet by using a mouse to point and click on key words or graphics.

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